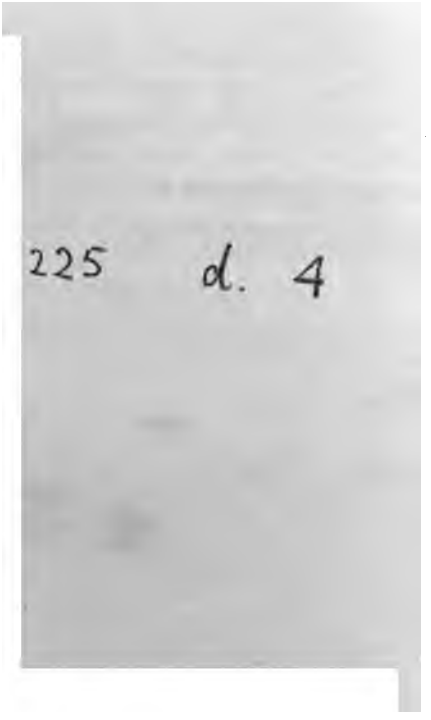
CHANNEL PILOT.

PART I.

SOUTH-WEST AND SOUTH COASTS OF ENGLAND.

1882.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THE

CHANNEL PILOT,

PART I.

SOUTH-WEST AND SOUTH COASTS OF ENGLAND.

COMPILED

BY

STAFF-COMMANDER JOHN W. KING, R.N.

SIXTH EDITION.

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TO

THE SIXTH EDITION.

The Channel Pilot, Part I., contains sailing directions for the approaches to the English Channel, for the Scilly islands, and for the south-west amd south coasts of England, extending from Trevose head on the coast of Cornwall to the North Foreland.

This work is based on the original directions by the late Admiral Martin White, published in 1830, and which reached their fourth edition in 1850; and also on the various Admiralty surveys subsequently executed, especially those made in the years 1873–1881, as well as on information derived from local authorities.

The first edition of the present work was compiled by Staff-Commander J. W. King in 1856; and revised editions were published in 1863, 1869, 1874, and 1878. The present edition has been revised by Staff-Commander J. C. Richards.

Seamen are invited to transmit to the Secretary of the Admiralty, notices of any errors or omissions they may detect in this work, in order that the information may be made use of for the benefit of navigation.

F. J. E.

Hydrographic Office, Admiralty, London,
November 1882.

CHAPTER IV.

START POINT TO THE NEEDLES.

CHAPTER V.

NEEDLES TO SELSEA.—THROUGH NEEDLES AND SOLENT CHANNELS TO SOUTHAMPTON, COWES, AND RYDE; SOUTH COAST OF ISLE OF WIGHT; EASTERN ENTRANCE TO SPITHEAD; AND PORTSMOUTH, LANGSTON, AND CHICHESTER HARBOURS.

CHAPTER VI.

SELSEA BILL TO NORTH FORELAND.

IN THIS WORK THE BEARINGS ARE ALL MAGNETIC, EXCEPT WHERE MARKED AS TRUE.

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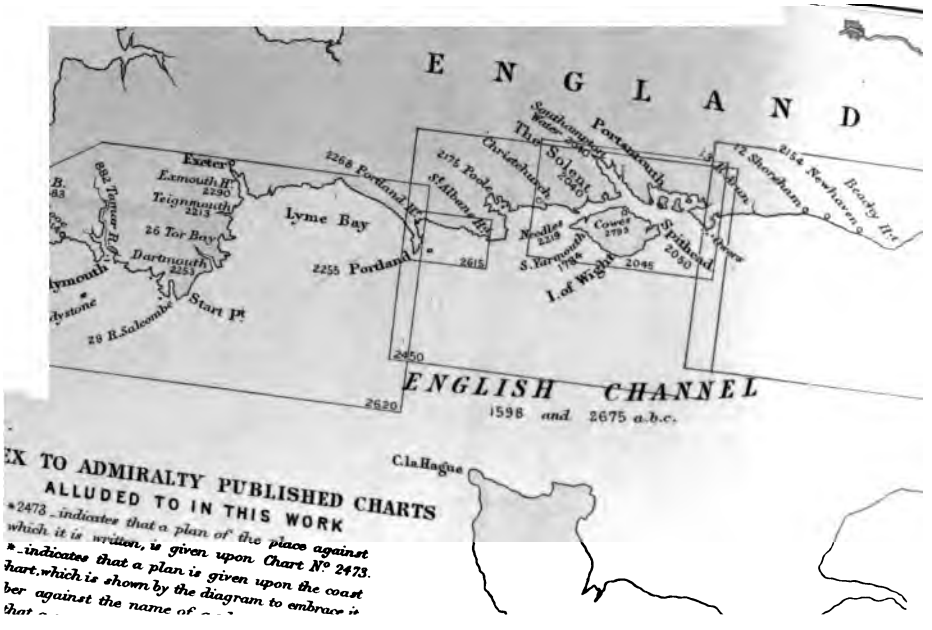
ONE CABLE IS ASSUMED TO BE EQUAL TO 100 FATHOMS.

THE SOUNDINGS ARE REDUCED TO THE DEPTHS OF LOW WATER OF ORDINARY SPRING TIDES.



EX TO ADMIRALTY PUBLISHED CHARTS
ALLUDED TO IN THIS WORK

*2473 _ indicates that a plan of the place against which it is written, is given upon Chart No. 2473.

* _ indicates that a plan is given upon the coast chart, which is shown by the diagram to embrace it

ber against the name of

THE CHANNEL PILOT.

PART I.

SOUTH-WEST AND SOUTH COASTS OF ENGLAND.

For the latest information respecting the several lights included in this work, seamen should consult the Admiralty lists of lights for the British islands, and for the north and west coasts of France. Those light lists are published early in the current year, corrected to the preceding 31st December.

possibility of ascertaining a correct parallel, the approach to the Scilly islands, or to Ushant, should be made with extreme caution; because under such circumstances the course steered, the log, the lead, and the nature of the bottom, are the seamen's only guides.*

It should ever be borne in mind when approaching the Channel, that even under the most favourable circumstances the frequent use of the lead is desirable; but when from the state of the weather, and the consequent absence of celestial observations a ship's position is dependent on dead reckoning, the lead becomes of primary importance, and its constant use indispensable to safe navigation. It is true that the soundings in deep

* *See* Admiralty charts, British islands No. 2; English channel No. 1598; and English channel, in 3 sheets, Nos. 2,675 (*a* to *c*).

water, say outside the 20-fathom line, cannot be depended upon with the desired exactitude, yet experience has proved that the depths may generally be trusted, to within two or three fathoms.

Many vessels, by neglecting this simple precautionary measure have been found within the Scilly islands, unconscious of their position; and instances are only too numerous where such neglect has resulted fatally to ships and crews among the dangerous Minquiers rocks, or the coast of France. Such disasters are all the more lamentable, when they might probably have been averted by simply using the lead and obtaining a continuous line of soundings.

It must not, however, be supposed that an occasional cast of the lead is all that is required, when, from the state of the weather or other causes, there is doubt respecting the exact position of the ship; for, as will be shown hereafter, an occasional cast *only* may possibly be a fruitful source of danger. By referring to the bank of soundings at the entrance of the channel, it will be self evident that a continuous line of soundings is essentially necessary, for the depths on the plateau are very irregular and comparatively shallow soundings of the same depths will be found as far off as the 10th meridian of west longitude, as well as near the land.

The decreasing depths of water, therefore, are too irregular to act as a guide, nor is the quality of the bottom of a sufficiently distinctive character to be relied on; for instance, when approaching on the parallel of Scilly or 49° 53′ N., the depth of 73 fathoms may be struck 150 miles off the Scilly islands, as well as at 75 miles from the group, and although at the outer sounding the bottom is generally of fine sand, whilst at the inner, sand and mud, the distinction is too slight to be serviceable.

This, and other cases which might be cited, is sufficient to illustrate the absolute necessity for continuous soundings; for, supposing a ship should be deemed to be on the outer spot, whilst she was actually on the inner, the result might be most disastrous; whereas had frequent soundings been obtained, the comparison of the intervening depths between the two positions with those marked on the chart would give increased confidence, and lessen the possibility of mistake. Thus frequent sounding should be the rule, and seamen would do well to bear in mind that the value of the lead is enhanced in proportion to the frequency of its use.

The Compass.—Too much attention cannot be given to the compass, especially in iron ships, for it is only by constantly observing its error that the navigator is able to shape a course with accuracy: it is therefore strongly recommended that before making the land, an opportunity should be taken to ascertain the deviation at least on the eight principal points. There are supplied to Her Majesty's ships tables of sun's true bearings, by means of which and a compass bearing of the sun, the com-

bined amount of variation and local deviation is determined by inspection; and the value of such knowledge so easily attainable when approaching after a long voyage, narrow waters like the English channel, must be apparent to the practical navigator. By means of the simple elements, viz., apparent time at the ship to the nearest minute, the latitude, and sun's declination (the two last need only be approximate), the sun's true bearing is found in these tables; and if at the same time the sun's compass bearing be taken, the difference must be the *whole error* of the compass; and as the value of the variation at the geographical position of the ship can be procured from the Admiralty chart of magnetic curves, it is evident that the difference between it and the *whole error* must be the deviation for that point of the compass to which the ship's head was directed when the observation was taken.

Determination of Ship's Position.—When the horizon is tolerably clear by night, the planets, bright fixed stars, and pole star, may frequently be used for determining the latitude, and if the meridional altitudes of two stars, one north and one south, be obtained, the mean result—supposing the observations to be made with care—would probably be within 2 or 3 miles of the truth. The longitude may also be obtained from observations of stars east or west, and if deemed necessary the true azimuth of the object may also be determined at the same time. No opportunity should be lost of ascertaining the ship's real position, and the navigator would do well to avail himself of the various methods by which the merest chance observations of heavenly bodies may be turned to account, including the simple and ingenious problem known as "Sumner's method."

Currents.—As the most watchful efforts to obtain an observation may at certain seasons fail, it is necessary in shaping a course up channel to review the lately prevailing wind and weather, in order to make allowance for the apparent set of the swell, and influence of any probable current. This last consideration will, however, require great caution, for the currents of these seas being merely the prolonged movement of the water produced by recent, and possibly remote, gales, the actual direction of the movement may differ from the apparent run of the swell.

Should the distant storm be surmised to have blown from the S.W., the probability would be in favour of the resulting current setting towards the Irish coast, and up the Irish channel; or if the gale be supposed to have been from the westward, that the current would be running to the eastward, and unite with the set into the English channel.

Too much confidence, however, must not be placed in such inferences, for it has been clearly shown by the late Major Rennell that in certain cases, the long ocean swell rolled in by westerly gales to the Bay of Biscay

accumulates there, so as to form in the bight of that gulf a head of water, which cannot escape to the westward along the Spanish shore. In consequence of the [illegible] is [illegible] along the coast of France to the north-westward, thus forming a temporary but decided current, [illegible] traversing the line of entrance to the English channel, and [illegible] extending beyond the south-west angle of Ireland. It does not appear, indeed, that this phenomenon is of frequent occurrence, but to a vessel without means of verifying her latitude, the consequences of being swept to the northward of Scilly in the course of a night might be disastrous, and therefore every navigator should be alive to the possibility of being entrapped by this unexpected and anomalous current.*

The BEST PARALLEL for entering the Channel is between 49° 15′ and 49° 25′ N., *according to the inclination of the wind*; because, between these limits the position of the vessel can be ascertained with the least degree of uncertainty, not only as regards the depth of water, but also the quality of ground (oaze or sand), which is not so well defined in any other latitude. The keeping on this parallel is rendered more necessary, in consequence of the rotary motion and northerly inclination of the tide, westward, south westward, and southward of Scilly.

Between these parallels the 100-fathom edge of the bank of soundings will be found in long. 10° 55′ W., and the ground a mixture of sand and dark greenish oaze. A depth of 335 fathoms, sand and oaze, has been found in 11° 30′ W., but it is very rarely that a ship strikes soundings outside the 100 fathom edge. Proceeding towards the Channel from the meridian of 10° 55′ W., sand and oaze will be found for about 25 miles farther eastward, the depths then decreasing to 80 and 70 fathoms, and the ground changing to coarse and fine reddish-yellow sand and shingle. This is the surface of the Great Sole bank which lies athwart this parallel nearly at right angles, its length being about 36 miles, and its breadth 9 miles. The southern part of the bank is in lat. 49° 4′ N., long. 9° 55′ W., trending thence in a N. by W. direction.

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* The easterly current from the North Atlantic ocean strikes the land near cape Ortegal, in Spain, and then appears to divide into two branches; the northern portion flowing eastward along the coast of Spain, then north along the west coast of France, where it is felt at 30 or 40 miles off shore, and is 15 or 20 miles across; it becomes wider as it proceeds northward, and is probably at times joined by the streams from the rivers of France. Near the parallel of 48° 20′ N. it is about 80 miles in breadth, and its direction nearly N.W., passing 15 or 20 miles westward of Ushant, and across the entrance of the English channel. It has been found to run from half a mile to a mile an hour, and varies according to the strength and direction of the lately prevailing winds those from the westward causing a heavy swell, and considerable augmentation in its force.

Passing this bank the water will again deepen to 80 fathoms, and the bottom will be again sand and oaze, until as far eastward as long. 9° 30′ W., when it will again change to clean sand, whence no more oaze will be obtained as long as the parallel of 49° 17′ N. is preserved: on the contrary, if oaze form any part of the substances brought up by the lead after passing this meridian, the vessel must be to the northward of 49° 17′ N., as there is no oaze to the southward of this parallel, when eastward of long. 9° 30′ W.

On the parallel of 49° 25′ N., however, oaze will be found in long. 8° 40′ W., though it will be again lost in long. 7° 50′ W.; here the depths suddenly decrease from 75 to 62 and 58 fathoms, the bottom being composed of coarse light-yellow and dark-gray sand, alternately with shingle. This is the surface of the Haddock bank, which crosses this parallel in a north-easterly direction, and from the southern end of which, Scilly bears E. ¾ N., 70 miles. Passing this bank, the water will again deepen, with oaze and sand mixed; the oaze will eventually be lost at 18 miles farther eastward, or in long. 7° 20′ W.

On the Parallel of Fastnet Rock; or that of 51° 23′ N., and in long. 11° 34′ W., are 286 fathoms, the ground a sort of fine dark viscous brown sand. Thence, in proceeding eastward, the depths will decrease suddenly. In long. 11° W. are 96 fathoms, fine dark sand, and hence to long. 10° 30′ W. the depths decrease more gradually—about 4 fathoms every 5 miles—but again decrease suddenly until within 16 miles of the land. At the distance of 21 miles westward of Mizen head there are 60 fathoms, and 9 miles farther off 80 fathoms oazy ground will be found.

If bound for the BRISTOL CHANNEL from the Atlantic vessels may keep the parallel of Trevose head, or that of 50° 30′ N., with a view of counteracting the north-westerly and northerly excess of tide which prevails in the Irish channel, because this promontory projects a considerable distance north-westward beyond the general direction of the Cornish coast. The land also, being high and steep, renders it an eligible spot for a landfall between the Land's End and Hartland point, whence a vessel may with confidence shape a course for the Bristol channel. On this parallel the 100-fathom line will be struck in long. 10° 40′ W. And nearly on the same parallel, or in lat. 50° 35′ N. and long. 8° 7′ W., is the western edge of Labadie bank; this bank has a depth of 38 fathoms, fine dark sand, and is 7 or 8 miles long in an east and west direction.

But if at all certain of his latitude, the mariner should run for Lundy island, which is high bold land, and in clear weather the lights may be seen 30 miles. If foggy, the leads give good warning of the approach, as 5 miles to the westward of the island the 30-fathom edge will be struck, and all within or to the eastward is of less depth. Should no land be

... long 20 fathoms, the ship should proceed with the same ... but may go on 27 miles beyond Lundy, towards Swansea or ... and she does not shoal the water to less than 20 fathoms.

The Nymph Bank may be defined as a broad flat, or southern ... of the shelf or shore bank of the south coast of Ireland, between ... and ... of the Old Head of Kinsale on the west, and the Saltees on ... about 35 miles off shore. It appears to be comprised between ... of the 40 and 50 fathom lines of soundings, and the bank may ... not less than 70 miles long from east to west by an average width ... 27 miles; its broadest part being 40 miles, a little west of the meridian of Waterford. The general quality of the bottom is mud, sand, and shells ... sand, clay and stones in the middle portion, and sand with ooze ... eastward: the depths are rather irregular, varying between 40 and 50 fathoms, on an average perhaps 45 fathoms at low water.

The bank abounds with cod, hake, and ling, particularly between the months of April and September, and is much frequented on this account by Irish fishermen. The tide causes numerous ripplings over it, and when the wind blows strong, the sea breaks heavily, particularly when opposed to the tide.

On a radius of 18 miles from the Smalls lighthouse, in any direction between N.W. by W. and S.W., the bottom is almost exclusively composed of ooze, or ooze and sand. To the north-westward, as well as to the eastward of these limits, the bottom suddenly becomes a sort of dark-reddish sand, which ground is the peculiar criterion of an approach to the Bristol channel. In running from the westward, therefore, for the mouth of this channel, if the ground brought up by the lead be ooze, or ooze and sand, the vessel cannot be southward of lat. 50° 57′ N., but must be northward of that parallel, and westward of the meridian of Grassholm, let the depth be what it may. If, on the contrary, the soundings are wholly free from ooze, she must be eastward of the latter meridian. The transition from ooze to sand in this neighbourhood is so evident that it cannot be mistaken.

On the Parallel of Scilly, or that of 49° 53′ N., the 100-fathom edge will be struck in about long. 10° 45′ W., with fine dark-brown sand. Proceeding on this parallel, the depths fluctuate between 80 and 70 fathoms as far eastward as long. 9° W., where, on the northern part of a small knoll named Cockburn bank, there will be 68 and 45 fathoms over a bottom of sand; thence to long. 8° 20′ W. the soundings rather increase, and again decrease towards long. 8° W., near which meridian, the depth will suddenly fall to 40 fathoms; this is the south-western edge of Jones bank.

The shoalest part of Jones bank, with 39 fathoms in lat. 49° 53′ N., long. 7° 58′ W., is distant from Scilly 60 miles, and on the same parallel.

The portion of the bank having less than 50 fathoms appears to extend about 7 miles in an east and west direction ; there is also a shoal patch of 51 fathoms 11 miles farther to the north-east. The bank has 65 to 70 fathoms close-to, and is composed of fine and coarse gray and yellow sand, interspersed with brittle shelly substances, and minute yellow, reddish, angular stones, but the ground around is wholly oaze. The tide causes great ripplings on all parts of it, but particularly between the periods of high water and 4 hours ebb. There are several other small knolls or banks between it and the Nymph, though none have less water than 55 fathoms, but no bank exists between it and the Scilly islands.

The soundings 18 miles from the Scilly islands, in any westerly direction between the limits of N.N.W. and S. ¼ W., do not materially differ ; the depths are from 55 to 60 fathoms, whence they shoal pretty gradually towards the rocks. The ground to the southward of the islands within the above radius, though in quality nearly the same, is somewhat finer and more tenacious than that to the westward and north-westward. The bottom, however, in both cases consists chiefly of fine, or coarse sandy-mixed ground, of a pale white, or grayish colour, which becomes coarser and darker coloured in approaching Scilly, with a mealy surface, interspersed with small stones, and pieces of shells; but there is no oaze, nor any matter that can be mistaken for it, at, or within, the above distance from the islands in any direction ; and, moreover, the transition from oazy ground to that of any other quality, northward, westward, and south-westward of Scilly, is always evident, the alteration being manifest even on the distance of one mile.

The soundings to about 36 miles from Scilly in any westerly direction between the limits of N.N.W. and S. ¼ W., are from 63 to 67 fathoms ; and if oaze form any part of the substances brought up by the lead, the vessel can neither be to the southward of lat. 49° 38′ N., nor to the northward of lat. 50° 17′ N., but must be upon or between those parallels. On the other hand, if under the above circumstances, the ground be fine or coarse sand of nearly the colour and consistency of beaten pepper, or light gray sand or reddish brown sand with minute pieces of shells ; or, indeed, of any quality in which oaze forms no part, she cannot be between those parallels ; but must be upon, or to the northward of 50° 17′ N., or upon, or to the southward of, 49° 38′ N., and nearly in the Channel fairway.

In thick weather the Scilly islands should not be approached within the depth of 60 fathoms, as the vessel will not then be more than 15 miles from the rocks.

On the Parallel of Ushant (Ile d'Ouessant), or in 48° 28′ N., the 100-fathom edge of soundings is struck in 9° 45′ W., and at 20 miles to the eastward the water shoals to 87 and 84 fathoms; the latter depths

are on the north-western part of the Little Sole bank, and the soundings continue irregular until as far eastward as long. 8° W. The general direction of the 100-fathom edge of soundings between the parallels of 49° and 51° 30′ N. appears to be about N.N.E. ½ E. and S.S.W. ½ W. From lat. 49° N. the edge of the bank suddenly trends away to the south-eastward, and 70 miles S.W. of this spot Captain Dayman, R.N., got a cast of 2,275 fathoms.

In lat. 48° 55′ N., long. 10° 51′ W., there are 217 fathoms, ground wholly oaze, of a dark muddy-greenish colour; and 12, 15, and 21 miles to the south-eastward of this position there is no bottom at 230 fathoms. In lat. 48° 27′ N., long. 9° 45′ W., are 107 fathoms, sand and oaze, and 2 miles only to the southward of this, 358 fathoms will be found, alternating in the same manner towards the southern part of the Little Sole bank, whence the edge of soundings is distant only 8 or 9 miles.

The southern part of the Little Sole bank is in lat. 48° 18′ N., long. 8° 50′ W., and thence trending in a northerly, north-westerly, and westerly direction, it occupies a space of about 27 miles from N.W. to S.E., and nearly the same in an easterly and westerly direction. This bank, like that of the Nymph, shoals in patches from 88 to 66 fathoms, all of which are steep-to, having between them from 90 to 138 fathoms. The shoalest part, 66 fathoms, is 153 miles W. by N. ½ N. from Ushant light-house, and the quality of the ground on the bank is coarse, or of fine grayish sand, mixed with small reddish-black and yellow pebbles, and pieces of various shells. The bank, as well as the whole extent of the edge of soundings, may always be discovered in fine weather from the numerous ripplings in its vicinity, and in boisterous weather the transition from deep to shoal water is rendered apparent by the sudden alterations in the colour of the water, which changes from blue to a disturbed green.

Passing the Little Sole bank the depths will be from 95 to 90 fathoms, fine light coloured sand and pieces of ribbed shells; and on the same parallel, 15 miles farther eastward, and 135 miles from Ushant, they will decrease to 88 fathoms, though the bottom is nearly the same in quality. As Ushant is approached, though the depths decrease, they will be found to vary only a few fathoms throughout a considerable distance; for instance, at the distance of 48 miles from, and on the parallel of Ushant, they will be 72, 71, and 70 fathoms, with a sort of coarse pale yellow ground, resembling semi-indurated marl, and a mealy surface, interspersed with broken pieces of shells and a substance like chaff.* At the distance of 27 miles from the

* Captain Methuen of the Peninsular and Oriental Company's Steam Ship *Kaisar-i-hind* when, in October 1880, entering the channel from the south-westward, the ship being in lat. 48° 4½′ N., long. 6° 19′ W., struck soundings in 60 fathoms, sand and shells: from this position Ushant was distant 54 miles in an E. ½ N. direction. Proceeding on a N.E. ½ E. course 2 and 5 miles respectively, depths of 63 and 69 fathoms were obtained;

island, the soundings are from 66 to 63 fathoms, with ground of a similar description, and 65 fathoms will be found within 9 miles of the rocks. In thick weather, therefore, when approaching Ushant, do not come into less water than 70 fathoms, and keep the lead constantly going.*

BEST LINE of APPROACH.—After due consideration of the foregoing statements, it will be manifest that vessels bound into the Channel from the south-westward in thick weather, and uncertain of their position, should run well to the northward, when eastward of the meridian of 10° W., until oaze forms part of the soundings; and that coming from the north-westward they should, for the same reason, borrow well to the southward, when eastward of that meridian, until the soundings are free from oaze, thus ensuring a safe parallel to run on to the eastward.†

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and again at a distance of 10½ miles on that course, 68 fathoms, sand and shells. These depths lie some miles seaward of the 70-fathoms line, as shown on the charts.

H.M. surveying vessel *Porcupine*, Staff-Captain Parsons, when sounding in the approaches of the channel in the summer of 1881, sounded in 56 fathoms, sand and shells, in lat. 48° 24′ N., long. 6° 33′ W. This bank, situated some 20 miles N.N.W. of Kaisar-i-hind bank, is 6 miles long within the depth of 60 fathoms.

* The 100-fathoms line of soundings passes about 65 miles to the south-west of Ushant and skirts the coast of France at nearly the same distance as far as the 45th parallel, the water deepening suddenly outside the 100-fathoms line. On the parallel of the Chausée de Sein (commonly called the Saints,) the transition from deep to shoal water is very sudden; in lat. 48° 2′ N., long. 8° 4′ W., 326 fathoms were obtained, the bottom being dark-bluish gray mud, whilst only 8 miles westward of this position the depth was 529 fathoms; and the whole of the south-western edge of the bank on which the British Isles, and the north-western portion of France rests, appears to be equally steep. In the parallel of Rochelle, a depth of 900 fathoms was obtained, 30 miles westward of the 100-fathom edge of the bank, and 2,275 fathoms at 60 miles.

Between the parallels of Penmarc'h point and Rochefort, or more precisely between the latitudes of 47° 53′ and 45° 50′, there is a remarkable tract of soft mud, limited to the south-east by the Plateau de Roche Bonne. It extends about 150 miles in a north-west and south-east direction, is 20 miles in breadth, and useful to verify a vessel's position. The surface of this mud is very soft, especially on its edges, where it is mixed with a little very fine gray sand, and it will scarcely adhere to the lead. To the eastward the mud is more firm, and westward the bottom becomes more or less rocky. This difference between the qualities of the bottom leaves the bed of soft mud in a north-west and south-east direction.

Off the mouth of the Loire, between Belle Ile and Ile d'Yeu, the depths vary from 37 to 19 fathoms, and the difference between the two qualities of the bottom is less perceptible. Between these isles the bottom is composed of sand and gravel, and of broken shells. In the offing, westward of the soft mud which has been described, the bottom is of sand, of a grayish colour, and frequently mixed with broken shells. This quality of the bottom continues westward to soundings of 180 fathoms, and extends in a north-west and south-east direction, between the parallels of about 45° 50′ and 47° 25′.

† For steam vessels entering the English channel from the southward, much caution is requisite in rounding Ushant. That island is surrounded by dangers in all directions; there are numerous rocks, the channels are intricate, the tides rapid, fogs and thick weather

As, during the prevalence of strong southerly and westerly winds, the tides are warped more astream than usual, and found to run considerably longer as well as with greater velocity to the northward and westward than at other periods; it is recommended,—with a view of maintaining any particular parallel,—that when running from the edge of soundings towards the Channel during spring tides, with the wind blowing strong from between South and West, that the course should be shaped half a point more to the southward than usual.

Soundings off Scilly.—When running upon either of the parallels of 49° 15′ and 49° 25′ N., or anywhere between them, if the water shoal to 68 and 66 fathoms, with soundings of fine sand, mixed with pieces of white and yellow shells, and minute brown angular granite, as well as other stones of different shapes unconnected with ooze, Scilly will bear nearly E.N.E., and be distant about 40 miles; the depths for 24 miles farther eastward will not materially vary nor decrease. On the meridian of Scilly there are 65 and 60 fathoms on the parallel of 49° 25′ N., and 67 fathoms on the parallel of 49° 15′ N. Here, however, the soundings will be coarse sand, mixed with rotten rocky substances and flat shells; and thence by steering E. ¼ S. 45 miles, a land-fall will be made about the Lizard.

Soundings off the Lizard.—There are 49 and 47 fathoms on the meridian of the Lizard when 12 miles from it, and 51 fathoms at the distance of 24 miles. In running for this position on the above E. ¼ S. course, the depths will shoal gradually from 67 to 52, the proportion being about 4 fathoms every 9 miles; but the ground, after passing the meridian of Scilly from either of the above parallels, will change to a pale whitish colour,* resembling that of semi-indurated marl with a mealy surface, a peculiarity which continues as far eastward as the meridian of the Ile de Bas, on the French shore, and thus confirms the vessel's relative position in respect to Scilly and Ushant. The bottom on the meridian of the Lizard, in the depth of 51 fathoms, will be of a corresponding description, with a variety of broken shells.

The soundings off the Lizard, at and between the distances of 21 and 15 miles, in any direction between W. ¾ S. and S. by E. ½ E., do not

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are not uncommon, and as might be expected, wrecks are frequent. No vessel should approach within 5 miles, or if the weather be thick, come into less than 70 fathoms water until the parallel of the island be passed. Around Ushant the flood sets to the north-east, and the ebb to the south-west, and at springs the tides run at the rate of 3 or 4 miles an hour, the flood stream turning to the eastward as it slacks, and thus setting more directly on the rocks. In the offing, the stream continues to run for 3 hours after the time of high water on the shore. Between Ushant and the Saints, the flood tide sets to the eastward, and ebb to the westward. *See* foot note p. 4 on currents in the bay of Biscay, and preceding note on soundings southward of Ushant.

* This is invariably the colour of the ground when to the southward of the fairway.

materially differ, the greatest variation being from 51 to 45 fathoms; and thence the depths gradually decrease towards the Lizard, within 3 miles of which are 40 fathoms. At 5 and 4 miles to the south-eastward of the Lizard the soundings are from 4 to 5 fathoms deeper, and the ground coarser than those at similar distances to the south-westward and southward of it.

The FAIRWAY—of the Channel, when eastward of Ushant or the Lizard, should always be considered as within the limits of 12 and 24 miles from the English coast, if the wind will permit; not only in consequence of the dangers which exist on the opposite coast, but because the depths increase and decrease more *progressively* on the English, than on the French shore.

Generally speaking, the water in the entrance of the Channel is from 8 to 10 fathoms deeper towards the French coast than towards the English The soundings, too, are coarser, the stones are larger, and the different substances altogether more loose and disconnected, and the compound of a paler colour than on the northern side of the Channel.

A close attention, therefore, to the peculiar character of the soundings together with the remarkable ripplings and overfalls, which so generally prevail even in the finest weather, off the French coast, will always verify the vessel's position, as to whether she be to the northward or southward of the Channel fairway.

Should the vessel, however, after being as far eastward as the Start in her progress up Channel, be thrown to the southward of the fairway, or should a scant southerly wind, with indications of a gale, make it necessary to gain an offing to the southward, and, in doing so, the water is found to suddenly deepen from 37, 39, and 40 fathoms to 50, 55, and 60 it may with confidence be concluded that she is in or near the stream, or parallel of the Casquets; near the south-western part of Hurds deep. Or if the soundings deepen from 45 to 70, 80, or even 95 fathoms, that she is in the northern part of Hurds deep; in either case she should haul to the northward into the fairway, carefully bearing in mind the set of the tide.

The south-western portion of Hurds deep is 37 miles W. $\frac{1}{2}$ N. from the Casquets, with general depths of from 50 to 60 fathoms; it thence trends round the northern side of the Casquets, stretching away north-eastward of Alderney, nearly as far as the meridian of cape de la Hague; and in this part of the Deep the soundings range from 60 to 95 fathoms. From the latter depth the Casquets bear S.S.W. $\frac{1}{2}$ W. distant 8 miles, and from the depth of 92 fathoms they bear S.S.E. $\frac{1}{4}$ E. $8\frac{1}{2}$ miles. Between these positions, a distance of $7\frac{3}{4}$ miles, is the deepest part, and the soundings vary from 81 to 93 fathoms. Though other discrepancies may be traced among the soundings in various parts of the Channel, there are no such

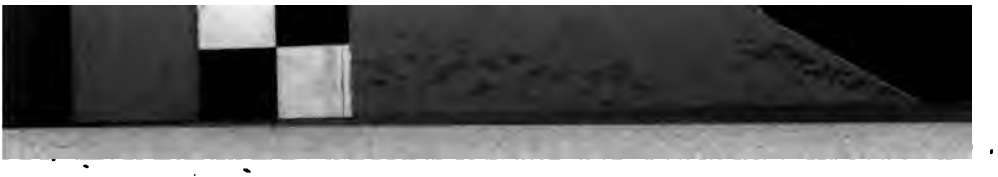
point of union and separation is not, however, stationary, but moves from west to east between Beachy head and the North Foreland, a distance of 60 miles, both on the rising and the falling tide. When the water at Dover begins to fall, the separation begins off Beachy head. As the fall continues, this line creeps to the eastward; at two hours after high water it has reached Hastings; at three hours Rye; and thus it travels on until at low water by the shore, it has reached the line extending from the North Foreland to Dunkerque. At this time the Channel streams, eastward and westward of Dover strait, have ceased running, and it is slack water; but the intermediate tide in the strait is still running to the westward.

When the water at Dover begins to rise, the Channel streams have made and both set towards Dover; that eastward of the strait consequently goes with the intermediate tide, which has not ceased running to the westward, while that westward of the strait meets it, and this opposition continues throughout the rising water at Dover. The point of meeting begins off Beachy head at low water, and gradually shifts its position eastward as the water rises by the shore; the meeting of four hours before high water, is nearly the same as the separation at two hours after high water; and so moves on during the subsequent hours, until about the time of high water at Dover, the point of junction has reached the North Foreland, and the Channel streams have ceased running, leaving the intermediate tide in the strait, still pursuing its course to the eastward.

Within the next hour the Channel streams have made, east and west, so that now the intermediate tide falls in with the stream eastward of the strait, and travels with it, whilst it separates from that westward of the strait, dividing at Beachy head, as at first.*

WINDS.—The prevailing winds in the Channel are those from the western quarter, which generally blow during two-thirds of the year. Gales from the westward are felt in all seasons, but from November to March inclusive they are most frequent and generally last three or four days. Of these, a S.W. gale is considered the most dangerous in the eastern part of the Channel, for when accompanied by rain it blows in violent gusts, and sometimes suddenly changes its directions to N.W., North, and even to N.E., without losing its strength, and causing in a few hours, a heavy sea upon the French coast to the southward of cape Grisnez. If the wind remain fixed in either of the latter points, and its force moderates, the weather becomes fine; but should it back round to the S.W., bad weather is sure to return. It has been generally remarked that those gales which occur during spring tides are more violent, and last longer, than

* For the Inshore Streams, *see* page 149.



those which take place during the neaps, and that it is at the beginning of the flood that they acquire their greatest strength.

Gales from North to N.E. are also violent, but they usually last only from 24 to 36 hours, and the wind does not shift as it does with those from the westward. These winds cause a heavy sea on the flood stream, and during their continuance the land is generally covered with a white fog, which has the appearance of smoke. This is also the case with all easterly winds, which are sometimes of long duration, and blow with great force.

When S.E. winds are accompanied by rain they are often violent, and almost always turn into gales, during which the wind in the squalls flies quickly round to N.E., and sometimes to North and N.W., making it dangerous to be upon the French coast when these unexpected changes take place. If it remain fixed in either of the latter points, and moderates, the weather is soon re-established, but should it return to the S.E. or South, the bad weather will continue.

Moderate winds from N.W. to N.E. bring fine weather. In the summer the N.E. winds blow more particularly in the afternoon. In the morning there is a light breeze from the S.E., but towards noon it changes to N.E. and freshens; towards the evening it decreases; at night a calm ensues and the cool air condenses the vapours. When this condensation does not take place, it is a sign of a change of wind.

Calms are of rare occurrence, and do not last long, except in summer. When they occur during winter, it is regarded as the precursor of bad weather. The most certain indications of bad weather are swell in the offing during a calm, and surf on the coast.

In wet winters snow is abundant, and when it blows, the wind continually changes its direction, and the snow, which whirls and obscures the air, prevents the land from being seen. During the intervals of these snow showers there is often great difficulty in recognizing the coast which may be in sight, as the snow completely changes its appearance.

The greatest quantity of hail falls during the months of March and April. These hail showers cause sudden changes in the direction of the wind, and are consequently dangerous to sailing vessels navigating near the shore.

Fogs and Mirage.—Fogs are frequent in all parts of the Channel, and they are formed both on the English and French coasts in the valleys and low marshy lands, whence the winds drive them out to sea. In summer they only hide the land in the morning, as they are readily dispersed by heat or a light breeze; but the moist haze, driven in by westerly winds from the sea, is more tenacious, and only yields to strong winds. This haze is accompanied by a short sea, and frequently turning to rain, brings bad weather.

[illegible] CHANNEL

[illegible] sign of [illegible]

[illegible] Compass. [illegible] 1882 [illegible] the English [illegible] present general [illegible] S.S.W. and N.N.E. *true* [illegible] Between the meridians of [illegible] the variation [illegible] and therefore [illegible] corrections to the courses [illegible] Channel, especially [illegible]

[illegible] of an early date, and [illegible] within a recent [illegible] for every successive [illegible]:—

[illegible]	[illegible] W.	1860	- 21 15′ W.
[illegible]	[illegible] W.	1870	- 19 54 W.
[illegible]	[illegible] W.	1880	- 18 32 W.

[illegible]

COAST OF FRANCE.[illegible]

LIGHTS. [illegible] the southern coast of [illegible] account of those prominent [illegible] the navigator may at times fall

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[illegible] variation of 24 27 appears to have been attained.

[illegible] **Lights.** [illegible] the French Government has given notice, dated 29th [illegible] France, lights of the catoptric character (or by [illegible] being visible through a limited arc, may be seen when the light is approached within the distance of [illegible]ths or [illegible]ths of the given range of

in with, during his passage up or down the English channel. The French coast is fully described in the Channel Pilot, Part II., a work which every mariner having to navigate that side of the English channel should have.

Ushant (Ile D'Ouessant).—This steep craggy island, lying W. ¾ N. 10½ miles from the north-west extremity of France, is 4¼ miles long W. by N. and E. by S., 2 miles wide, and in clear weather may be seen 15 miles distant.

North-east Light.—There are two lighthouses built on Ushant; one stands near its north-east extreme, from which, at an elevation of 272 feet above high water, is exhibited a *fixed* white light of the first order, visible in clear weather from a distance of 18 miles.

North-west Light.—The other at the north-west extremity of the island, is a circular tower, painted with black and white horizontal stripes, and, from an elevation of 223 feet above high water, is exhibited a *revolving* light, the eclipses of *twenty seconds* duration, being succeeded by *one red* and *two* white faces, each lasting *twenty seconds*, and visible in clear weather from a distance of 24 miles.

Fog trumpet.—A fog trumpet is sounded at the west point of the island, during foggy weather, at intervals of *ten seconds;* the duration of the blast being *two seconds*, the sound will generally be heard 3 miles in calm weather.

Ile de Bas.—This low isle cannot be seen farther than 9 miles, and when bearing S.S.W. is blended with the coast, from which it is only separated by a narrow channel. It is about 2 miles long E.S.E. and W.N.W., and one mile wide, and most of the rocks surrounding it cover at high water. The circular lighthouse built on the western part of the isle exhibits a *revolving* white light, of the first order, which attains its greatest brilliancy *every minute.* The light is elevated 223 feet above high water, and is visible in clear weather from a distance of 24 miles; in ordinary weather the eclipses do not appear total within the distance of 12 miles. Position, lat. 48° 44′ 45″ N., long. 4° 1′ 45″ W.

Triagoz.—This dangerous ledge is about 4¼ miles in extent W. by N. ½ N., and E. by S. ½ S., and about one mile broad; its eastern

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visibility, 55° to 60° on each side of the centre of such arc—that is, when not otherwise obscured.

Thus:—On the north coast of France, the light exhibited on Lanvaon heights, L'Abervrac'h river entrance, and which is visible from a distance of 14 miles through an arc of 36°—or 18° on each side of the leading mark (Lanvaon and Vrac'h islet lights in line)—can be seen when within the distance of 5 miles from the light through an arc of about 115°—or about 57° on each side of the above-mentioned line of direction.

[redacted]

[redacted]

[redacted]

Héaux de Bréhat.—The lighthouse is erected on the north-east part of a rocky ledge, named Héaux de Bréhat, and is in lat. 48° 54′ 35″ N., long. 3° 0′ 20″ W. It exhibits, at 161 feet above the level of high water, a *fixed* white light, of the first order, which shows white, except between the bearings of W.S.W. and W. ½ S., where the light is *flashing red*, and between the bearings of N.W. ½ N. and W. by N. ¼ N., where it shows fixed *red*. The north-east sector of red light shows over Barnouic ledge; the south sector of red light shows over Horaine, Echaudes, Men-March, and Ringue-Bras ledges. The intervening space of 23° between the red sectors, through which the *fixed* white light is visible, is free of danger, except that of Roch-ar-Bel shoal, the dangerous part of which has only 11 feet on it at low water.

In clear weather the white light should be visible from a distance of 19 miles.

Vessels in the offing, with the white sector of Héaux de Bréhat light in sight, will be clear of danger in the channel between Barnouic and la Horaine ledges. Approaching from the eastward, having passed well to the northward of la Horaine ledge, and crossed the line of the leading lights of Bodic heights and la Croix rock (Trieux channel), in line, a north-west course may be steered, and the flashing red sector of light entered.

Les Roches Douvres.—This dangerous rocky ledge, the outermost of the off-lying dangers fronting St. Brieuc bay, occupies a space 3½ miles long, north-west and south-east, and 2½ miles wide, and from it rise a group of 12 rocky heads, which never cover. The north-west edge of the ledge lies N.E. by E. ¼ E. 15 miles, and the south edge E. by N. ⅔ N. 16 miles, from Héaux de Bréhat lighthouse. On the highest rock, which is situated in the middle of the group, and whose summit is about 9 feet above the highest tides, stands a white iron lighthouse, from which, at an elevation of 180 feet above high water, is exhibited a white light, showing a bright *flash every five seconds*, and visible in clear weather from a distance of 21 miles. Its position is in lat. 49° 6′ 30″ N., long. 2° 48′ 55″ W.

During foggy weather a bell is sounded at intervals of *three seconds*.

Hanois.—On the south-western rock of the Hanois group, one mile off the west end of Guernsey, stands a light tower 117 feet from base to vane, built of gray granite, and exhibits, at 100 feet above the level of high water, a *revolving red* light of the first order, which attains its greatest brilliancy *every forty-five seconds*, and should be seen in clear weather from a distance of 12 miles. The light is obscured to the eastward by the island of Guernsey, between the bearings of W. by S. and N.W.

A bell is sounded at Hanois lighthouse in thick or foggy weather *every fifteen seconds*.

From Hanois light the Casquets bear N.E. by E. ⅛ E., distant 21¼ miles.

CASQUETS.—An isolated group of islets and rocks, half a mile long W.N.W. and E.S.E., by one to two cables broad, lies 6 miles N.W. by W. ¼ W. from Alderney telegraph; they are named the Casquets, probably from their remarkable helmet or cap-like appearance.

Near the centre of the group is the highest rock,* on which is built a stone lighthouse, 75 feet high, coloured white, which exhibits at an elevation of 120 feet above high water a *flashing* light (*triple, half minute*) which

* Previous to the year 1877 three lights were exhibited from three separate towers built on this rock. These lights occupied a triangular position with respect to each other, the vertex of the triangle being to the south. The present light is exhibited from the north-west tower which has been raised; the east tower, reduced in height, is now a fog-horn house, and the south tower, also reduced in height, is a store house.

shows three successive flashes of about *two seconds* duration each, divided by intervals of about *three seconds* of darkness, the third flash being followed by an eclipse of about *eighteen seconds*. The light should be visible in clear weather from a distance of 19 miles.

Fog Horn.—During thick or foggy weather a powerful siren trumpet will give three blasts of two seconds duration each, in quick succession *every five minutes*. Between the first and second blasts, and between the second and third, intervals of three seconds occur.

Cape de la Hague, the north-western extreme of Normandy, is low and sandy, but the coast at the distance of 3 miles to the S.S.W. suddenly rises into a high bluff promontory about 320 feet above the level of the sea, on the top of which is a small hummock, whose slopes extend to the almost perpendicular cliffs on its western side. This promontory may be seen in clear weather from the distance of 24 miles. One of the most conspicuous objects in the vicinity of cape de la Hague is the light-house built on the summit of the largest rock, named Gros du Raz, half a mile W. ½ S. from the cape; and exhibits, at an elevation of 154 feet above high water, a *fixed* white light, which possesses the advantage of being rarely obscured by the fogs from the land, and as seldom by the mists from the sea. The light is of the first order, and visible in clear weather from a distance of 18 miles.

Cape Barfleur, the western extremity of the Baie de la Seine, is a low point, off which about one mile distant are some rocks which uncover at low water. Two towers of unequal height stand at the extremity of the point, and serve to mark its position by day. The highest, or southern tower, exhibits a *revolving* white light of the first order, which attains its greatest brilliancy *every half minute*. The light is elevated 236 feet above high water, and may be seen in clear weather from the distance of 22 miles. Beyond the distance of 12 miles the eclipses are total between the bright faces, but within 12 miles there is a faint continuous light. The northern, or old tower, was the first built, and served as a lighthouse until the year 1836, when the southern tower was erected for that purpose.

Cape de la Heve is the northern point of the entrance to the river Seine, and forms the south-western extremity of the chalky cliffs which terminate the plain of Caux. The cape is perpendicular about half way down from its summit, the foot of the cliff being covered with the débris of frequent slips and fallen masses. Two square lighthouses, 106 yards apart, N.E. ½ N. and S.W. ½ S. of each other, of equal height, 66 feet high, built of freestone, stand on the summit of the cape near the edge of the cliff; each exhibiting a *fixed* white *electric* light of the first order which should be seen in clear weather from a distance of 27 miles. The

intensity of these lights will be doubled in thick fogs. The southern lighthouse is 300 feet from the edge of the cliff.

Fécamp.—The lighthouse, 56 feet high, stands on the summit of Fagnet point, at about 93 yards from the edge of the cliff, and exhibits at 426 feet above high water a *fixed* white light, dioptric and of the first order, visible 18 miles. It is in latitude 49° 46′ 5″ N., longitude 0° 22′ 5″ E., but the position it occupies, upon the crest of an abrupt hill, at the edge of a deep valley covered with meadows and watered by abundant streams, causes it to be frequently obscured by mists, or completely hidden by fogs.

Point D'Ailly, in lat. 49° 55′ 5″ N., long. 0° 57′ 30″ E., is of a rounded form, and, although less elevated than many other points of the coast, may be easily recognized, as the perpendicular chalk cliff forms only half its height. A thick bed of clay and vegetable mould lying on the top of the chalk, slopes down to the edge of the cliff, and a little behind it stands a square tower, 66 feet high, which exhibits, at 305 feet above high water, a *revolving* white light, the eclipses of which take place *every minute*, but are not total within the distance of 12 miles. The light is dioptric, of the first order, and in clear weather may be seen 27 miles distant.

Point Touquet is at the southern entrance of the River Canche, and is marked by two octagonal lighthouses erected on it 273 yards apart, N. by E. ¾ E. and S. by W. ¾ W. of each other, each exhibiting a *fixed* white light, dioptric, and of the first order, at 174 feet above high water, and are visible in clear weather 20 miles. The southern lighthouse is in lat. 50° 31′ 25″ N., long. 1° 35′ 30″ E.

Cape Alprech is a perpendicular rocky cliff, of a brownish-red colour, elevated 135 feet above high water; the foot of the cliff is skirted by a shelf of rock covered with boulders, which dries one cable out at low tide.

A square lighthouse, 33 feet high, stands on the summit of the cape, about 87 yards from the edge of the cliff, near the tower of the old semaphore, and S.W. 2¼ miles from the entrance to Boulogne, in lat. 50° 41′ 55″ N., long. 1° 33′ 40″ E. It exhibits, at an elevation of 161 feet above high water, a *fixed* white light, varied *every two minutes* by a *red flash*,* which is preceded and followed by a short eclipse. The light is dioptric, of the third order, and visible in clear weather from a distance of 10 miles.

Cape Grisnez, 167 feet high, is one of the most remarkable headlands on the northern coast of France. From the cape Dungeness

* Attention to this *red flash* will prevent the light at cape Alprech from being mistaken for that at Beachy head.

bears N.W. by W. ¾ W. 23½ miles, and the South Foreland N. ¾ W. 17¾ miles. The lighthouse is erected one quarter of a mile to the southward of the cape, about 100 yards from the edge of the cliff, and exhibits, at an elevation of 226 feet above high water, a white *revolving* light, the eclipses of which succeed each other *every half minute*. The light is *electric*, of the first order, and visible in clear weather 22 miles; the eclipses are not total in ordinary weather within the distance of 12 miles. Inshore a fainter light will be visible.

This light cannot be mistaken for the light at Calais, which is varied *every four minutes* by a *white flash*, preceded and followed by short eclipses, nor for that at cape Alprech, which is varied *every two minutes* by a *red flash*.

GENERAL DIRECTIONS.

Scilly to Lizard.—When running up Channel during thick weather, Scilly should not be approached within the depth of 60 fathoms, as in that water the vessel will not be more than 15 miles from the rocks; neither come into less water between Scilly and the Lizard than 44 fathoms, by which precaution the vessel will pass at least 2 miles southward of the stream of the Wolf, the parallel of which cannot be approached, eastward or westward of the rock, as long as that depth be preserved.

From the Lizard to the Start, the course is E. ½ S., distance 63 miles. By keeping outside a depth of 42 fathoms a vessel will pass about 5 miles to the southward of the Eddystone, in the stream of which are 34 to 37 fathoms. To ensure being well clear of the Start a depth of not less than 30 fathoms should be preserved.

To avoid all shoal water off the Lizard, keep Godolphin Hill open of Rill head, N. ½ W., until Lowland point opens east of Black head N.E. ¾ E.; Lizard lights kept in sight southward of Beast point W. ½ N., until St. Anthony's light bears N.N.E., clears the Manacles.

From the Start to St. Catherine Point, the course is E. ½ S., distance 93 miles. When eastward of a line joining Start to Casquets, a vessel will be in the West Channel stream (see page 12), which will carry her towards Beachy head while the water is rising at Dover, and away from it while it is falling there.

From Start point to Portland bill, the course is East, and the distance 48 miles; and from Portland bill to St. Catherine point E. by S. ¼ S. 44 miles. By altering the courses successively between the meridians of the different headlands, as the vessel advances up Channel, she will better counteract the direct effects of the tidal streams.

Between the Start and Portland, in thick weather, do not approach the

shore within the depth of 30 fathoms until the meridian of Portland is passed; between Portland bill and St. Catherine point do not stand into less water than 25 fathoms. The former precaution will keep the vessel southward of the Shambles and Portland race, as well as in the fair stream of tide; and the latter will prevent her from experiencing the considerable indraught of both flood and ebb into all the deep bights from Portland to the Owers, particularly on the flood round Durlston head into Poole bay, which, if a vessel come within the influence of, will lead her into danger. The use of the lead in thick weather is therefore strictly enjoined as the only safeguard.

In fine weather the Skerries may be approached to not less than 20 fathoms; Prawl point open of Start point W. ¼ N. clears its south end, and Berry head open of Downend point bearing N.E. ¼ N. leads to the eastward. There are no outlying dangers in the bight between Berry head and Portland hill.

No vessel should approach the Shambles within the depth of 20 fathoms; Anvil point open of St. Alban's head, bearing E. ¼ N., leads three quarters of a mile to the southward of this danger, which is now marked by a light-vessel.

Between the Needles and St. Catherine point a vessel may stand into 15 or 16 fathoms at low water, a safe mark is to keep Needles light N.W. by N. until St. Catherine light bears N.E. On the flood this part of the coast is exceedingly dangerous, as that stream sets directly towards the ledges, which in some places extend nearly one mile from the shore. St. Catherine point in bad weather should be given a good berth to avoid the race and overfalls near it.

The soundings to the south-westward, southward, and south-eastward of the Casquets, within the supposed radius of 9 miles, do not materially differ from those in similar directions from Portland, so that it is possible in bad weather for the former to be mistaken by a stranger for those of the latter, particularly if hazy weather prevents the light of the Casquets from being distinguished, unless indeed soundings were accidentally struck on a bank which lies S.S.W. from the Casquets.

As the distance between the Lizard and Portland differs only 5 or 6 miles from that between the Lizard and the Casquets, and as this is the narrowest part of the Channel westward of Beachy head, it is necessary to exercise great caution; for should a stranger be in this supposed southerly position during a winter's night, between the periods of low water and three-quarters flood on the shore, when the indraught is strong into the gulf of St. Malo, and with a gale between N.W. and S.W., the consequences may be most disastrous. This is a strong additional argument for a constant progressive attention to the lead from the instant of first striking soundings, by which such a perilous situation would be avoided. The

Casquets bear from Start point S.E. ½ S., distant 57 miles, and from the bill of Portland S. by W. ½ W. 47 miles.

St. Catherine Point to Beachy Head.—From 4 miles south of St. Catherine point to a mile south of Royal Sovereign light vessel, the course is E. ¾ S., distant 67 miles. By pursuing this route a vessel will pass about 4 miles to the southward of the Owers light-vessel, and the same distance southward of Beachy Head light, and will not be materially affected by the indraught between the Isle of Wight and the Owers on either tide. In thick weather by keeping outside the depth of 20 fathoms vessels will pass south of the Owers, and ensure the true channel tide.

The depth of 10 fathoms at low water is a valuable guide for vessels turning to windward between Dunnose and the Owers; for by keeping outside it, they may be certain of being clear of all danger as long as the Nab lights are kept to the northward of N.E. by N. and not brought to the westward of N.W. ½ W. Approaching the Owers light from the westward it should on no account be brought to bear more southerly than S.E. by E. ½ E. After passing to the southward of the Owers light and proceeding towards Beachy head, do not bring it to bear to the southward of S.W. nor shoal the water to less than 10 fathoms at low water.

Beachy Head to Dungeness.—From the Royal Sovereign light-vessel to a position 2 miles south of Dungeness light, the course is E. ¾ N., distance 23 miles.

In the event of the light-vessel being adrift, Beachy head light-house kept in sight, open of the pitch of the head N.W. by W. will lead 1¼ miles outside the Southern head, and when the two high white mills at Battle come on with Bexhill N.N.E. a vessel may haul up E. ¾ N. for Dungeness. At night, Beachy head should, under these circumstances, be passed at 3 to 4 miles distant, so as to get the ship's position by bearings of the light; then run to the eastward, with the light just open of the cliffs N.W. by W., and, when on that bearing, the light is 10 miles distant, and the soundings 15 fathoms at low water, Dungeness may be steered for.

Hitherto the vessel coming up channel has been influenced by the West Channel stream, which turns with the rising and falling water at Dover. In Dover strait, between Beachy head and North Foreland, she will be influenced by both West and East Channel streams, which meet at Beachy head when the water at Dover begins to rise, and separate at Beachy head when it begins to fall (see page 12).

Vessels turning to windward in thick weather between Beachy head and Dungeness should not go into less than 15 fathoms at low water.

In fine weather at low water they may stand into 15 fathoms between Beachy head and Bexhill, from thence eastward 9 fathoms, till near

Stephenson shoal, which should not be approached to less than 10 fathoms.

Rye church in line with the new church spire, near Rye harbour, N.N.W. ¾ W., leads close to the west end of Stephenson shoal in 26 feet, and Dungeness light E. by N. ½ N. leads southward of it.

Dungeness point is steep to, there being 15 fathoms a short distance from the beach. If running to the westward from Dungeness do not steer to the west of W. by S. till Beachy head light opens out, when a course can be shaped down channel.

Dungeness to the Downs.—From 2 miles south of Dungeness to a mile south of the South Foreland the course is N.E. by E. ¾ E. distance 21 miles. When beating up or down channel the seaman should make himself thoroughly acquainted with the turn and direction of the streams (page 12 and table at pages 280, 281), and particularly their meeting and separation in Dover strait.

A safe depth to stand into between Dungeness and the South Foreland is 12 fathoms at low water. Dungeness light W.S.W., or Beechborough summer house on with Hythe church N.E. by N., leads outside the Swallow and Newcombe banks.

Between Hythe and Eastware bay tack immediately the South Foreland high light is shut in by Shakespear cliff.

Standing off shore, when Dungeness light bears N.W. the vessel will be on the line of the south-west extreme of the Ridge, and may approach that shoal to 17 fathoms at low water or until the Varne light-vessel bears N.N.E. ½ E. When north of the light-vessel it must not be brought to bear to the westward of S.W., nor the water shoaled to less than 16 fathoms at low water.

Off the South Foreland at low water, there are 8 fathoms at a quarter of a mile, 10 fathoms at half a mile, and 14 fathoms at one mile; having rounded it at the latter distance, when the South Foreland lights are in line W. ¾ N., or when the houses at Deal come in sight, steer N.E. by N. for the Downs. South Foreland high light over the middle of Old Stairs bay S.W. is the leading mark through the Downs. *See* remarks on large ships passing through, page 266.

Vessels intending to turn through the Gull stream to the northward should not attempt it until half flood, nor to the southward, until half ebb.

In working to the northward between South Foreland and Deal the shore may be approached to any convenient depth; to clear Deal bank keep Upper Deal mill well open south of Deal hospital, bearing W. ½ S. Standing off shore towards the South Goodwin, when between the South Sand Head light-vessel and Bunt Head buoy, the light-vessel must not be brought to bear to the westward of S.W. by S. Proceeding through

the Gull stream when nearing the Bunt head buoy large ships should not bring the Gull stream light-vessel to the northward of N.N.E. ½ E.; but towards Bunt head in the vicinity of the N.W. Bunt buoy it may be brought as far as N.N.E.

Stand towards the Brake sand between South Brake and Middle Brake buoys, no nearer than to have the North Foreland lighthouse twice its apparent breadth open eastward of Broadstairs north cliff; and between the Middle Brake buoy and North Bar buoy till the South Foreland high lighthouse appears midway between Kingsdown and Walmer castle, and in line with the Middle Brake buoy S.W. ½ S.

The north-west side of the North Goodwin, and Goodwin knoll, may be approached till the Gull stream light-vessel is a little open south of Upper Deal mill or outer end of Deal pier bears S.W. by W. ½ W.; and towards the Gull and other shoals forming north-west side of Gull stream till South Foreland high lighthouse is in line with the north cliff of Old Stairs bay. South Foreland lighthouses and South Sand Head light-vessel in line bearing W. ¾ N., leads to the southward of the Goodwin sands. When between the South Sand head and East Goodwin light-vessels, the latter should not be brought to bear to the eastward of N.E. ½ E.; and when to the northward of the East Goodwin light-vessel the North Sand Head light-vessel should not be brought to bear to the eastward of North.

LIGHT VESSELS.—Riding Lights.—For the purpose of showing in which direction the vessel is riding, a white light is exhibited from the forestay of each light-vessel, at a height of 6 feet above the rail. This regulation applies to all light-vessels under the jurisdiction of the Trinity House, London.

Signals.—When a light-vessel is driven from her proper position to one where she is of no use as a guide to shipping, the following signals will be made, namely:—The usual lights will not be exhibited, but a *fixed red* light will be exhibited at each end of the vessel, and a *red* flare shown *every quarter of an hour*. By day, the balls or other distinguishing mast-head marks will be struck. Also, that if from any cause the light-vessel be unable to exhibit her usual lights whilst at her station, the riding light only will be shown.

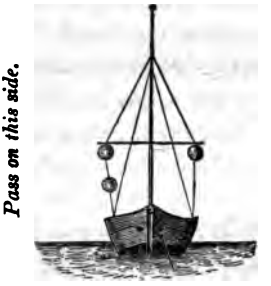
The firing special rockets of an explosive character from a light-vessel will denote the need of assistance from the shore.

Vessels are liable to a penalty of 50*l.* for fouling a light-vessel or a buoy, in addition to the expenses of making good any damage so occasioned.

WRECK-MARKING VESSELS.—When light-vessels or other craft are placed to mark the position of wrecks, they will be distin-

guished as follows, in order that Mariners may be able to learn on which side of them they should go:—

Vessels marking wrecks will have their top sides coloured green, and will exhibit—



By Day—Three balls from a yard, 20 feet above the sea; two placed vertically on the side that shipping may safely pass, and one on the other side.

By Night—Three *fixed* white lights, similarly arranged, but the ordinary riding light will not be shown.

Mariners will thus know on sighting a wreck-marking vessel that she is so employed; and that they should pass of her on that side on which the two balls or two lights are shown.

SCILLY ISLANDS—SEVEN STONES—WOLF ROCK.

The SCILLY ISLANDS, and rocks in their vicinity, lie about 21 miles westward of the Land's End, and occupy a space of about 47 square miles. The group consists of 48 islands, but of these only five, viz., St. Mary's, St. Agnes, St. Martin's, Trescow, and Bryer, are inhabited, the population in 1871 being 2,090; of the others, 18 are capable of bearing grass; the remaining 25 are barren. Besides the above, all of which are tenanted by gulls and rabbits, the rocks above and below water are too numerous to admit of description. The chief exports are early potatoes and lobsters, many tons of which are annually shipped to London and Bristol. The imports consist of timber, coals, flour, bread, and general merchandize. Coals and water are put on board steam-vessels; but fresh provisions are not immediately obtainable.*

These islands may be seen in clear weather a distance of 15 miles. In the year 1637 a conical stone beacon, or day mark, 38 feet high, was erected on the eastern point of St. Martin's; it is painted with red and white horizontal bands, and its top is 185 feet above high-water ordinary springs. This beacon, the telegraph-tower on the highest part of St. Mary's,

* *See* Admiralty chart, Scilly islands, with views, No. 34; scale, $m=3$ inches.

the old windmill on Peninnis head the south point of that island and the Star fort on its western end, with the lighthouses on St. Agnes island and Bishop rock, are good landmarks, and serve well to point out this dangerous group.

The near approach to these islands from the south-westward and westward requires great judgment, by reason of the rocky ledges which project in those directions, the principal of which are the Nundeeps, Crim, Bishop, Crebinack, Bishops ridge, and Shovel. The Crim and Bishop, the westernmost rocks of Scilly, are always above water, and on the latter is a stone lighthouse. At a little to the south-westward of the Crim and Bishop the tide runs strong to the north-westward, north, and north-eastward 8 hours out of 12. The south-eastern shores of St. Agnes, St. Mary's, and Menewethan islands may be approached as near as half a mile, as there are no dangers beyond that distance.

From the rocky ledge named the Poll bank, St. Agnes lighthouse bears E. by N. ½ N. 6⅓ miles, but it carries a depth of 15 or 16 fathoms, is surrounded by deep water, and is in no case dangerous, otherwise than to open boats in boisterous weather. The old windmill on Penninnis head in line with Goreggan islet (one quarter of a point open eastward of the lighthouse) leads directly to it.

St. Mary's Island, the largest of the Scilly group, is 2 miles long from north to south, and 1¾ miles broad; and attains an elevation of 128 feet. The little town of St. Mary's, consisting of 204 houses, contains a market house, a church, two chapels, three schools, and a resident clergyman, who also serves St. Martin's. There are also three building slips with blacksmith's shops; two piers; several wells, and a tank capable of containing 3,400 gallons of water.

Life-boat.—A life-boat is stationed at St. Mary's.

Trescow Island is 2 miles long north and south, and three quarters of a mile broad; it contains 600 acres, and has a church, national school, and resident clergyman. An ample supply of water is obtained from five wells in different parts of the island.

Trescow look-out, with a flagstaff, is used as a signal station between the lighthouses and Seven Stones light-vessel.

St. Martin's Island, the north-easternmost of the group, is about 2 miles long north-west and south-east, and two-thirds of a mile broad; it contains 520 acres, 134 houses, a church and chapel. The most remarkable object is the beacon known as the Day-mark, which stands on the highest and eastern part of the island, at an elevation of 147 feet, the beacon being 38 feet high, and painted with alternate red and white horizontal bands.

Bryer Island is 1½ miles long from north to south, two-thirds of a mile broad, and attains an elevation of 133 feet. It contains 292 acres, three wells, and about 30 houses; there is a pilot's look-out on Watch hill, the highest point of the island.

ST. AGNES ISLAND, separated from St. Mary's by the sound, is one mile long, and three-fourths of a mile broad; it contains 269 acres, including Gugh islet, with which the island is connected by a narrow neck covering at three quarters flood. The island contains a church, chapel, and a resident clergyman; the people are well supplied with good water from four wells.

LIGHT.—The lighthouse, 74 feet high, circular and painted white, stands on the summit of St. Agnes island, and exhibits at an elevation of 138 feet above high water a *revolving* white light, which attains its greatest brilliancy *every half minute*, and in clear weather should be visible from a distance of 17 miles, except between the bearings of S. ¾ W. and W. ¼ S., when it is only seen at short intervals, being obscured by the northern islands of the group.*

The first darkness is occasioned by Gweal, when that islet bears S. ¾ W. The light is then visible from that bearing to S by W. ½ W., with the exception of a momentary darkness by Gweal hill on Bryer island; it is then obscured from S. by W. ½ W. to S.W. ¾ S., being only momentarily seen over the neck of Trescow island; and it is again visible from S.W. ¾ S. to S.W., with only two short intervals of darkness by the higher parts of Tean islet. From S.W. the light is shut in by St. Martin's island, and is not again visible until it reappears bearing W. ¼ S. over Peninnis head, the south extreme of St. Mary's island.

Pilots.—Strangers are recommended not to attempt the harbours of Scilly without pilots, whose attendance may always be depended on, even in the worst weather, as soon as the signal for that purpose is made. There are no fewer than 11 vessels distributed amongst the islands, and the conduct of the pilots is marked by skill and intrepidity.

A rocket apparatus is kept in the coast-guard watch-house, near the custom-house at St. Mary's, in case of shipwreck.

BISHOP ROCK.—The Bishop rock on which the lighthouse stands, is the highest of a cluster forming the south-westernmost of all the dangers of the Scilly group. These rocks are half a mile in extent, and were formerly dreaded in consequence of their off-lying position; but the erection of a light-tower has converted the danger into a safety beacon, and given

* In some directions and in some states of the atmosphere the bright face of St. Agnes revolving light may be seen before the fixed light of the Bishop; the mariner therefore should be on his guard.

increased confidence to the mariner when closing the islands from the south-west.

LIGHT.—The lighthouse, of stone, painted white, is 147 feet high, and from an elevation of 110 feet above high water exhibits a *fixed* white light, which should be seen in clear weather from a distance of 16 miles all round the compass, excepting between the bearings of S.W. ¾ W. and W. by N., when it is obscured by the intervening land of the group, a ray of light only being seen in a W. by S. direction, between the islands of St. Martin's and St. Mary's. The lighthouse bears W. ½ N. 4 miles from the lighthouse on St. Agnes island. A bell is sounded during foggy weather every 10 seconds.

Crim Rocks consist of a cluster of dangers six cables long, N.N.E. ½ E. and S.S.W. ½ W.; and of these the most conspicuous is the Peaked rock, 6 feet high, which lies 1½ miles N. ¾ E. from the Bishop lighthouse. The intervening passage is upwards of one mile across, and is the entrance of the channel known as Broad sound, which is fringed with dangers on either side, and is narrowed to less than half a mile between Le Jeffrey and Old Wreck shoals.

Broad Sound is one of many others leading into St. Mary's road, but as the leading marks are distant and not easily identified, the place should never be attempted by a stranger.

ST. MARY'S ROAD.—The Scilly islands possess several harbours for vessels capable of taking the ground, and also one for ships of large draught, viz., St. Mary's road; but the ground being loose sand is not very tenacious; indeed, this is generally the case, for the anchors come home long before a stay-peak can be obtained. The harbours in most esteem are, Old and New Grimsby, and St. Helen's pool. St. Mary's road affords shelter from all winds, except those from the westward between W.N.W. and S.W.; these bring in with them a heavy fetch, but a vessel can run to sea through Crow sound, at a proper time of tide; and to enable her to do this, the following elevations of the Crow rock above the surface of the water are given:—

This rock lies off the north end of St. Mary's, near Bants-carn point, and has an iron beacon with cage erected on it. It is remarkable in having three distinct heads, named Great Crow, Little Crow, and Crow Foot, by which the height of water over Crow bar may be estimated; the bar, however, varies in gales. The Great Crow is nearly awash at 5 hours flood; the Little Crow is awash at about 4 hours flood, or after 2 hours ebb; and the Crow Foot is nearly awash at one-quarter flood, or three-quarters ebb. At high-water, ordinary springs, there are 21 feet on Crow bar; at three-quarters flood, or one-quarter ebb, 17 feet; at half flood or

half ebb, 11 feet; at one-quarter flood, or three-quarters ebb, 5 feet; and at low water one foot; but more with westerly gales, and less with those from the eastward.

The anchorage in St. Mary's road is between the island of St. Mary's and that of Samson, and there are five distinct entrances to it, as shown on the chart, viz., St. Mary's sound; Smith sound; Crow sound, over Crow bar; Broad sound; and the North channel, between the Mincarlow rock and the Nundeeps.

ST. MARY'S SOUND.—The general depths in St. Mary's sound are from 6 to 13 fathoms, but the navigation through it to St. Mary's road is rendered intricate by the Wetnose shoal, the Round rock, and the Perconger ledge, lying off the Western shore; by the Little ledge, the Spanish and Bartholomew ledges, lying in mid-channel, the two latter being marked by conical black and white vertical striped buoys; and by the Gilstone, Pollard, and Woolpack rocks off the eastern shore; also the Trisky and Woodcock shoals lying off the north-west shore of St. Mary's. The Little ledge, the southernmost of these rocky dangers, has but 7 feet on it, and must be carefully avoided by vessels entering from the south-west.

Wetnose Shoal has 3⅔ fathoms water on it, from which Buzza mill is in line with Raveen rock, bearing N.E. ¼ N. Horse point open of Hoe point, W. by S., leads to the southward, and Hangman island in line with Stevel rock N. ½ E. to the eastward; this latter mark leads also eastward of the Round rock, which dries 4 feet at springs.

Perconger Ledge has 7 feet over it. Dropnose rock open of Carn Himbra point, S. by E., leads eastward; St. Agnes lighthouse in line with the Cow rock, S.W. ¾ W., leads south-east; and Carn Irishman, on Annet island, open north of the little Smith rock, W. ¾ N., leads northward of the danger.

Little Ledge, of small extent, with only 7 feet over it, lies one-sixth of a mile southward of the Spanish ledge, with Bryer church in line with Little Stevel rock, N. ¼ E., and Giant's castle just showing clear of south extreme of Carrickstarne rock, E. by N. ¼ N. Blue Carn in line with south extreme of Peninnis head, N.E. by E. ¼ E., leads 1¼ cables to the southward.

Spanish Ledges, two cables in extent, have depths of from one to three fathoms on them between rocky heads, which dry at low-water springs. The same mark for leading southward of the Little ledge will also lead south of Spanish ledge, as will also Newfoundland outer rock open of Giant's castle, E. by N. ¾ N.; the north-east end of Mincarlo islet in line with highest part of Great Minalto rock, N.N.W. ¾ W., leads

north-eastward; Hangman islet in line with the Stevel rock, N. ½ E., leads westward; and the Cow rock a little open north of Kittern rock, W. by N., leads northward.

A conical buoy, painted in black and white vertical stripes, is moored in 6 fathoms on the east side of the ledge, with north end of Mincarlo in line with west end of Great Minalto N.N.W. ¾ W.; and West house in Higher town in line with St. Agnes lighthouse W. ¼ N.

Bartholomew Ledges.—The 3-fathom boundary of these dangers is upwards of 2 cables in extent, and includes several rocky heads which dry at low-water springs. The old mill of Peninnis open south of Wras rock, E. by S. leads southward; Dropnose rock open east of Bow rock, S. by W. or Castle Bryer islet in line with high-water mark of Shark point (Samson island), N. by W. ½ W., leads eastward; Dropnose rock open west of Bow rock, S. ¼ E., leads westward; and Peninnis old mill in line with the battery on Woolpack point, S.E. by E. ¾ E., leads northward.

The eastern side of the ledges is marked by a conical buoy, painted in black and white vertical stripes, moored in 7 fathoms, with north end of Mincarlo in line with west end of Great Minalto N.N.W. ¾ W.; Woolpack beacon in line with Biggal S.E. by E. ½ E.; and Little Smith in line with the Bishop lighthouse W. ¼ S.

Gilstone Rock lies E. by S. 4 cables from Peninnis head, and covers at three-quarters flood. To pass southward of it, keep Menewethan islet in line with Newfoundland rocks, N.E. by E., until Great Smith rock opens of Peninnis head, W.N.W.

Pollard Rock, lying about 100 feet off the north-west point of Peninnis head, dries 7 feet at low-water springs.

Woolpack Rock projects nearly one cable and a half S.S.W. from Woolpack point, and dries a little before low water. An iron beacon with cage is erected on the rock.

Trisky and Woodcock Shoals.—Trisky shoal has 3⅓ fathoms on it, and Woodcock shoal only 8 feet at low water. Hangman island open west of Nut rock N. ½ E., leads westward of the Trisky; and the day-mark on St. Martin's in line with Greeb rock, N.E. by E. ½ E., leads northward of both shoals.

DIRECTIONS.—When bound to St. Mary's road through St. Mary's sound, bring the north-east end of Mincarlo islet in line with the middle of Great Minalto rock,* N.N.W. ¾ W., which will lead in the fairway between Woolpack rock to the eastward, and Little, Spanish, and

* *See* Views on chart.

Bartholomew ledges to the westward; the two latter being marked on their eastern sides, by conical black and white vertically striped buoys. Peninnis head and Stevel rock are both bold close-to.

Continue with the above mark on until the day mark on St. Martin's comes in line with Greeb rock, N.E. by E. ½ E., then steer direct for the anchorage in St. Mary's road. The best position is in 4 or 5 fathoms, with Hangman island, its breadth open northward of Nut rock, and distant from the latter one-third of a mile to the south-eastward. If intending to moor, place the anchors to the N.W. and S.E. to ensure open hawse with westerly winds.

Broad sound is chiefly used by vessels from the south-westward, but it is dangerous to those not well acquainted with the marks and the set of the tides. Run in between Bishop lighthouse and the Crim rock, but nearer to the lighthouse. The leading mark is Nornour island, its apparent length open northward of Bants Carn point, E. by N.

In proceeding with these marks on, the Gunner, Le Jeffrey, and Southward ledges will be left to the northward, and Old Wreck rock to the southward; and after passing these dangers, it will lead direct to St. Mary's road, where anchorage may be taken up as before. The Old Wreck is a sunken rock with 3 feet on it, lying about N.N.W., one quarter of a mile from Annet head and N.W. by W. ¾ W. from Great Smith rock. A black conical buoy is moored in 7 fathoms, half a cable N.N.E. of the rock.

The North channel is as dangerous as Broad sound to strangers. The best mark is St. Agnes lighthouse, in line with Great Smith rock S.S.E. ½ E. till the leading mark through Broad sound comes on as above.

Tides.—It is high water, full and change, at the Scilly islands, at about 4h. 30m.; equinoctial tides rise 20 feet, ordinary springs 16 feet, and neaps 12 feet. During blowing weather or after heavy gales from the southward, the tide flows about an hour longer. Northerly winds keep it back in the same proportion.

The tides at about 6 miles southward of the islands appear to set straight, and run for equal spaces of time, to the eastward and westward; but nearer to, and among the islands and rocks, they are subject to a variety of inflections and inequalities.

The flood sets from the S.W. around the islands on their east and west sides, and the two streams meet on the north-east, as indicated by the arrows in the chart.

Through St. Mary's sound the tide sets from the southward from half ebb to half flood, and from the northward from half flood to half ebb. The flood sets regularly through St. Mary's road from Broad sound, and over Crow bar, through Crow sound, to the eastward; the ebb sets in a contrary direction, but it is not strong.

Through the North channel the flood sets into St. Mary's road, and the ebb in the contrary direction.

The tide coming in through Broad sound from the S.W. sets through St. Mary's road towards the east end of St. Martin's island, where it meets the tide at 4 hours flood, coming round St. Martin's head, which makes the race off Hanjague; this latter prevailing, sets away S.W. by S. as far as Menewethan island, where, meeting Crow sound tide which runs out S.S.E., it makes an extensive race with spring tides, and both go off to the southward together.

In New Grimsby harbour, the tide at low water, runs in for one hour and a half, then runs out for 3 hours, turns and runs in $4\frac{1}{2}$ hours till it is half ebb; it then turns and runs out the other 3 hours till low water. But between the islands of Sampson and Bryer the tide runs in 8 hours from the westward, from low water till 2 hours ebb, and then runs out to the westward till low water.

At half flood, the tide from New Grimsby harbour sets over the flats, towards St. Mary's, until half ebb; and from St. Mary's road through New Grimsby harbour, from half ebb to half flood.

Into Old Grimsby harbour, St. Helen's pool, and Tean sound, the tide runs 9 hours, from low water to half-ebb by the shore; and it sets outward from the same for 3 hours only, that is from half ebb to low water.

To the south-east and southward of St. Agnes island there is an overfall, between 4 hours flood and 2 hours ebb, occasioned by the confluence of the two streams of tide at that period. This overfall is farther augmented by the unevenness of the ground over which the water runs; and sometimes extends as far seaward as 3 miles, but gradually subsides as the tides assimilate.

The SEVEN STONES are a cluster of dangerous rocks, lying nearly in the fairway between Scilly and the Land's End. They are one mile in extent N.N.W. and S.S.E., and are covered at high water. In rough weather the breakers upon them may be seen from a considerable distance.*

The two principal rocks of the cluster are named the Pollard, which appears at half ebb, and the South Stone which shows at 5 hours ebb. From the Pollard, which is the north-westernmost rock, the day-mark on St. Martin's bears W. by S. $\frac{3}{4}$ S. distant 7 miles; the telegraph on St. Mary's W.S.W. $9\frac{1}{2}$ miles; the Seven Stones light-vessel E. $\frac{3}{4}$ N. nearly 2 miles; and the Longships lighthouse E. by S. $\frac{3}{8}$ S. 15 miles. The South Stone lies S. by E. $\frac{3}{4}$ E. two-thirds of a mile from the Pollard.

* *See* plan of the Seven Stones on Admiralty chart, England, south coast, sheet 1, Trevose head to the Dodman, No. 2,565; scale, $m = 6{\cdot}8$ inches.

There are several other sunken rocks in the vicinity of these two, particularly to the northward and eastward of the Pollard; and to the westward of the South Stone; the former, generally called the Town rocks, and partially appear between the period of 4 hours ebb and low water, the latter have no particular name.

The whole of these dangers are steep-to; there being 38 and 40 fathoms water, at the distance of one mile only, on all sides. The only marks for the position of the Pollard which can be rendered conspicuous or intelligible to a stranger during the day, are the telegraph tower on St. Mary's in line with the north-west end of Nornour island, or Bants Carn point open eastward of Carniweather point. The telegraph tower on St. Mary's open eastward of the easternmost Carn of Great Granilly islet (it will be also open at the same time eastward of the remarkable conical shaped rock, named Hanjague) will lead half a mile south-eastward of the South Stone and of the rocks near it; and the telegraph shut in westward of Carniweather point (though its parapet will still appear over the land between the said point and the day-mark), will lead half a mile westward of the Pollard and the rocks in its vicinity.

SEVEN STONES LIGHT-VESSEL is moored in 40 fathoms, nearly 2 miles E. $\frac{3}{4}$ N. from the Pollard, and 2 miles N.E. by E. $\frac{3}{4}$ E. from the South Stone, and as long as she holds fast in that exposed situation there will be no difficulty in the passage between the rocks and the Longships. She exhibits at an elevation of 36 feet above the sea a white light showing *three flashes* in quick succession, followed by an interval of 36 seconds darkness, the whole revolution occupying *one minute*. The light is visible in clear weather from a distance of 11 miles.

St. Martin's day-mark bears from the light-vessel about W. by S. $\frac{1}{2}$ S. nearly 9 miles; the Longships lighthouse E. by S. $\frac{3}{4}$ S. $12\frac{1}{2}$ miles; and the Wolf lighthouse S.E. by S. $12\frac{1}{4}$ miles. The vessel is painted red, with the words *Seven Stones* on her sides, carries a ball at the mast head; and a powerful siren trumpet gives during thick or foggy weather, *three blasts* in quick succession *every two minutes*. A gun is fired if a vessel be seen standing into danger.*

In clear weather the objects on the Land's End may denote the position of the Seven Stones; for instance, the two churches of St. Buryan and Sennen, in line, will lead over the rocks to the north-eastward of the Pollard.

WOLF ROCK is a half-tidal rock, steep-to, lying E. by S. $\frac{1}{4}$ S. $20\frac{3}{4}$ miles from St. Agnes lighthouse; S.W. $\frac{1}{2}$ S. $7\frac{3}{4}$ miles from the Longships lighthouse; and W. by N. $\frac{3}{4}$ N. $23\frac{1}{2}$ miles from the light-

* For light-vessels, riding lights, and signals *see* page 26.

houses on the Lizard. At low water ordinary springs its length is 182 feet, north and south, its breadth being 132 feet; the rock uncovers 11¼ feet at low-water springs, 7¾ feet at low-water neaps, and is nearly awash at high-water neaps.

LIGHT.—The lighthouse on the Wolf rock, 143 feet from base to vane, is circular, of gray granite, and exhibits from an elevation of 110 feet above the level of high water, a *revolving* light, showing alternate *flashes*, of *red* and *white*, of equal intensity, at intervals of *thirty seconds* which should be seen in clear weather from a distance of 16 miles.

In foggy weather a bell is sounded *three* times in quick succession *every fifteen seconds*.

Soundings.—There are 34 fathoms within one mile of the Wolf rock on all sides, 38 fathoms in the stream of it eastward and westward, and 34 to 37 fathoms between the rock and the land.

DIRECTIONS.—When navigating between the Scilly islands and the Land's End, do not run between the Seven Stones and the light-vessel, but pass to the eastward of her; keeping the light-vessel, bearing westward of North, when approaching from the southward; and westward of South when approaching from the northward.

Caution.—In thick weather recollect that, the fog bell at the Wolf lighthouse is sounded *three* times in quick succession *every quarter of a minute*, whilst the fog bell at the Longships lighthouse is only sounded *twice* in the same period.

CHAPTER II.

TREVOSE HEAD TO THE LIZARD.

VARIATION IN 1882.

Trevose head	- 20° 45′ W.	Lizard -	- 20° 40′ W.
Longships -	- 20° 50′ W.		

TREVOSE HEAD.—Allusion has already been made to the fact (page 5) that Trevose head is one of the best landfalls to make when bound from the westward towards the Bristol Channel. When first seen it appears as a round island, and may be further known on nearing the land by the white lighthouse, 87 feet high, on its north-western part, and by the Quies rocks, lying one mile westward of it. A rocket apparatus is kept at Trevose farm in case of shipwreck.*

LIGHTS.—The lighthouse on Trevose head exhibits at an elevation of 204 feet above the sea an occulting white light, which should be visible in clear weather from a distance of 20 miles.

The light is under *occultation three times* in quick succession *every minute;* that is to say, it suddenly disappears for *three seconds*, and then as suddenly reappears at full power for *three seconds;* again suddenly disappears for *three seconds*, reappears at full power for *three seconds;* again disappears for *three seconds*, and suddenly reappears at full power for the remainder of the *minute.*

The Quies are a cluster of rocks above water, at a distance of nine-tenths of a mile W.N.W. from Dinas point, the western horn of Trevose head. These rocks are upwards of one-third of a mile in extent, and though between them and the Moor Quie—another mass of rock close to Dinas point—there is a deep water channel half a mile wide, it should never be used save in cases of necessity.

The COAST.—From Trevose head to Towan head, the distance is 8 miles S.W. ¼ S., the intervening shore, which falls back 1¾ miles, being high, precipitous, and indented. Park head lies S.S.W. ¼ W. 3 miles from Trevose head, and is foul for a distance of three cables from the shore. In the bay between Park head and Towan head, there are two inlets, the one is called Mawgan Porth, the other the Porth. Mawgan Porth, at 3½ miles E.N.E. of Towan head, is shoal at its mouth, and open to seaward. The Porth, at 1½ miles eastward of the head, is also open to

* *See* Admiralty chart, England, south coast, sheet 1, Trevose head to Dodman point, No. 2,565; scale, $m = 0{\cdot}5$ of an inch.

the westward, and dries at low water; it is, however, frequented by small vessels to unload coal. The tall square tower of St. Eval church, which stands about 2 miles to the south-eastward of Park head, is a prominent object on the outline at the back of the coast in this locality.

NEW QUAY HARBOUR.—Towan or New Quay bay, is immediately to the eastward of Towan head, and in its south-western part is the tidal harbour of New Quay formed by two piers, the southern of which runs out N.N.E. ½ E. 137 yards, and the northern pier S.E. 61 yards. On the southern pier head stands a tower with a flag-staff, and on the northern pier there is a crane capable of lifting 2 or 3 tons. The little town of New Quay is a rising watering place; and the pilchard fishery is pursued on a considerable scale.

The harbour, about 3¼ acres in area, is frequented by vessels of about 13 feet draught. The bar has 16 feet water on it with a 21 feet tide, and 10 with neaps of 15 feet, but the depth occasionally varies, for with a continuance of north-easterly gales, the sand is carried out of the harbour to the depth of 2 feet, and it again accumulates in moderate weather.

The entrance is 80 feet wide, and open to the south-eastward; but during northerly gales a heavy sea sets in, which causes the vessels lying on the south-eastern side of the harbour, with stern ropes made fast to the northern pier, to strike hard on the sandy bottom. The harbour should not be run for, with a ground swell on, nor with gales blowing on the land, for off the entrance, and for some distance outside, the sea breaks heavily. Water can be obtained in abundance from a spring in the cliff.

Life Boat.—A life boat is stationed at New Quay; also a rocket apparatus in case of shipwreck.

The Coast.—From Towan head the coast, deeply indented, extends 2 miles W. by S. to the north point of Holywell bay, marked by a rock above water named the Chick, off which is a sunken danger with 16 feet water; and thence to St. Agnes head the distance is 6⅓ miles S.W. by W. Between Towan head and Holywell bay is a creek named the Gunnel, which is capable of receiving small coasters at spring tides only; its outlet lies between West and East Pentire points, the channel being close to the latter. Off Penhale point, on the south side of Holywell bay, is Carter rock, which makes like a double pyramid when seen from the westward.

From St. Agnes head to the tidal harbour of Portreath, a distance of 4 miles in a south-westerly direction, the cliffs vary from 200 to 150 feet in height; but thence to Godrevy island, another 4 miles, the cliffs are about 250 feet high.

Carnbrae monument, near Redruth, is a prominent object from abreast the coast just noticed, its top being elevated 873 feet.

Trevanance is a small indentation, about 1½ miles E.S.E. from St. Agnes head, and has a small pier which can only be approached in

fine weather, at which time a red flag will be hoisted by day, and a light exhibited by night. It is a coast-guard station, where a rocket apparatus is kept.

ST. AGNES HEAD is a bold promontory over which is St. Agnes hill, with a beacon on its summit, elevated 617 feet above high water; there are several mine buildings and chimneys, on its north-east slope.

Boden Rocks are two high rocks distant one mile N.N.E. $\frac{3}{4}$ E. from St. Agnes head, with a clear deep water channel between.

PORTREATH is a tidal harbour chiefly frequented by coasters discharging coals and loading with copper from adjacent mines, with which the place is connected by railway. The eastern side of the entrance is marked by a white tower, known as the Day-mark, 25 feet high, and standing at an elevation of 123 feet above high water. Along the western side a pier runs out in a northerly direction, and within are two basins, inner and outer, capable of containing about 25 vessels of 150 tons burthen.

The sills of the basins are $5\frac{1}{2}$ feet above low water, ordinary springs; but at high-water springs there are $15\frac{1}{2}$ feet water, and $9\frac{1}{2}$ feet at neaps. The tide rises 18 feet at the entrance of the outer harbour at springs, and 12 feet at neaps.

On the eastern side of Portreath is a deep rocky bight, known as Goodern bay, and care must be taken not to mistake it for the harbour. Close to the shore, in the vicinity of Portreath, lie a number of remarkable islets, the principal of which are the Horse and Basset, rising respectively 86 and 100 feet above high water. Two-thirds of a mile to the south-west are the Crane islands, 126 and 121 feet high, and one-third of a mile further on are the Samphire islands, 91 and 148 feet above the same level. Thence to Navax point the low-water rocks do not extend above half a cable off shore; but off Navax point the Lethegga rocks extend one cable.

Portreath harbour should not be run for with a ground swell on, or with gales blowing on the land. Should a vessel get embayed between St. Agnes head and Godrevy island, and be under the necessity of running on shore, the best place for beaching is under Ayms point on the western shore of the harbour at the top of high water where, in most cases, the crew would be saved. A mortar apparatus is kept in readiness on the pier.

ST. IVES BAY, which is open to the northward, lies between Godrevy island and St. Ives head or Battery point, a distance of $3\frac{1}{4}$ miles in an East and West direction and from this line falls back 2 miles. On its western side is the tidal harbour of St. Ives, and at its head the estuary

of the Hayle river. Its eastern shore is bounded to the northward by Godrevy head, a bold headland 228 feet high, off which lies Godrevy island, with a rocky passage upwards of one cable wide between.*

GODREVY ISLAND.—Godrevy island is 80 feet high, with a detached islet off its north-west side, whilst the south-eastern side is studded with small detached rocks, that cover at half flood. A rocky ledge, named the Shore Lanner, visible at low water, extends half a cable from the western side.

LIGHT.—The octagonal stone lighthouse on Godrevy island, 86 feet high, exhibits at an elevation of 120 feet above the level of high water, a *flashing* white light, showing a *flash every ten seconds.* The light, which is intended to point out the danger known as the Stones, is of the first order, and in clear weather should be seen from a distance of 15 miles.

With a view of farther indicating the position of the Stones, a *fixed red* light is shown from the same tower, 27 feet below the *flashing* light. The *red* light is only visible when bearing from S. by E. ¼ E. to S.E. ¼ E., or in the direction of and covering those rocks.

During foggy weather a bell is sounded, one stroke *every five seconds.*

The STONES.—At the distance of $1\frac{1}{10}$ miles from Godrevy island lighthouse, in a N.W. ½ N. direction, is Hevah rock, the most off-lying of the dangerous cluster known as the Stones. This rock uncovers at low-water springs, and the 3-fathom boundary of the rocky bank surrounding it is more than 1½ cables in extent. The most extensive portion of the danger lies within Hevah rock to the eastward, and is nearly half a mile in extent N.N.E. and S.S.W.; with a deep water passage between it and Hevah rock, which should only be attempted in cases of great emergency. The rocks on this part of the danger which show are four in number, and they cover from first quarter, to two-thirds flood.

Marks.—Gurnards head, just open of Carnmen point W. ¾ S., leads one-third of a mile north of the Stones; and Knill's monument, which stands at an elevation of 545 feet, on with the north end of Porthminster farm (which stands low and has five distinct roofs) S.W. ½ W., also leads outside the Stones.

Gwinnear church, in line with the eastern side of Godrevy island, S. ¼ W., leads eastward; and Gwinnear church in line with Old Engine chimney S. by E. ¼ E., leads to the westward of the Stones.

By night when passing to the northward of the Stones, do not shoal to less than 12 fathoms at low water.

Buoy.—Formerly, large floating beacons were moored off the north side of the Stones, but they frequently broke adrift. These dangers are now marked by a black buoy in 10 fathoms, N.N.W. ¼ W., 1¼ miles from

* *See* Admiralty plan of St. Ives bay, No. 1,987; scale, $m = 4 \cdot 0$ inches.

Godrevy island lighthouse; but as it is frequently washed away, no reliance should be placed on its being in position.

The Sound, between the Stones and Godrevy island, is a safe passage, the least water being 4¾ fathoms. To run through, bring the summit of Trecrobben hill, 590 feet high, between Carrack Gladdon farm and Fishery beacon house, S.W. ¾ W.

Ceres and Bessack Rocks.—About one mile south-west of Godrevy head, on the eastern shore of the bay, at low-water mark, is Ceres rock, which covers at two-thirds flood; and N.N.W. of it, nearly half a mile from high-water mark, is Bessack rock, which covers at a third flood. Lelant church just open of Black cliff, S.W. ¼ W., leads north of the Bessack in 6 fathoms water.

HAYLE ESTUARY.—From Godrevy head to the mouth of river Gwythian, which flows into the sea at 6 cables to the southward, the eastern shore of St. Ives bay gradually slopes, and masses of rugged rock project off to low-water mark; and thence a long range of the Phillack towans or sandhills, 100 to 150 feet in height and covered with bent grass, extends to the entrance of the Hayle estuary. The beach, of fine sand and shell, runs out to the distance of 2 cables, but its level is continually altered by gales of wind.

The Hayle estuary is formed by the confluence of several small streams, which take their rise some distance inland. On the western side of the entrance a half-tide dike, 8 to 12 feet above low-water springs, runs out 643 yards in a northerly direction from Chapel Anjou point, having five perches, or warping posts, erected on it, and two black buoys to mark the continuation of the sand bank. The eastern side of the channel is marked by red buoys; the outer one being a can buoy, and the rest square shaped with rings for warping. The black nun buoy on the bar has no distinguishing mark on it.

Signals, Docks, &c.—A flag is hoisted near the Ferry house on the arrival of steam-vessels trading to the port, when there is sufficient water for them to cross the bar, which has 19 feet on it at high-water ordinary springs, and 13 feet at neaps. There are from 20 to 17 feet in the river off Hayle at high-water springs, and 14 to 11 feet at neaps. The graving dock at Hayle is 250 feet long, 48 feet broad at the entrance, and has a depth of 15½ feet on the sill at high-water ordinary springs; there are also sheers for lifting boilers, and foundries noted throughout the west of England for producing the largest description of steam engines, and pumping gear, for the mines.

Trade.—Supplies of provisions, water, and marine stores are readily obtainable at Hayle, which was made an independent port in 1864, with

St. Ives attached to it as a creek. The foreign and coasting trade at Hayle is very considerable, and the harbour affords excellent shelter for vessels. A steam-tug is stationed at the port to assist vessels in and out of harbour. In 1879 there belonged to the port 30 sailing vessels, representing 4,141 tons, and three steam-vessels. In 1879 there entered inwards 883 vessels of 102,299 tons.

LIGHTS.—Upon the rising ground on the western side of the entrance of Hayle estuary, and 217 yards within Chapel Anjou point, are two wooden lighthouses, each exhibiting a *fixed* white light only when there is a depth of 12 feet water over the bar. The high lighthouse, painted red, stands on a tripod; and the low lighthouse, near the edge of the cliff, is placed on four legs, and painted black. The lights are elevated 81 and 59 feet respectively above high water, and in clear weather should be seen from a distance of 6 miles. They are 99 yards apart, and when in line N.N.E. ¼ E. and S.S.W. ¼ W. lead through the best part of the channel.

On the outer end of Lelant quay is exhibited a *fixed red* light.

Life Boat.—A life boat, and rocket apparatus, are stationed near the Custom-house, on the eastern side of the harbour.

ST. IVES HARBOUR.—From Hayle to Battery point, or St. Ives head, the coast is composed of bold rocky cliffs, varied by three sandy bights. The summit of St. Ives head is 104 feet above high water.

Very little of the town is visible until St. Ives head has been rounded, and then the most prominent objects are the square tower of the church, 90 feet high, and some terraces on the high ground. The town is backed by several hilly summits, on one of which, amongst wood, is Tregenna castle hotel, and on another is Knill's monument, an obelisk whose base is 545 feet above high water; whilst more to the south-eastward is the rugged summit of Trecrobben hill, 590 feet high.

At one quarter of a mile southward of the head is the tidal harbour and town of St. Ives, celebrated for its pilchard fishery. The harbour is formed by a pier, built in 1770 by Smeaton, running out S. by W. ½ W., and then S.W., the whole length being 166 yards. In 1867 a wooden pier was erected, projecting with a curve from the inner end of the stone one, and running out 207 yards in a S.E. by S. direction.* Since the construction of the wooden pier the sheltered portion of the harbour has much silted up.†

The bottom of the harbour is composed of fine sand and shingle, which

* At about 60 feet from the end of the wooden pier is a gap in the pier (called Fishermen's gap) about 50 feet wide, this part of the pier was washed away in January 1881.

† Mr. Henry Bryant, Harbour Master, 1882.

dries 7 feet; there are large iron posts above high water for bow moorings, and two buoys with rings attached, for the purpose of making fast stern moorings; but on account of the ground swell, which is severely felt on this part of the coast, and the pier affording such limited shelter, it is sometimes difficult to secure vessels. There is a depth of 14 feet in the harbour at high-water ordinary springs, and 8 feet at neaps. The low water edge of sand extends from the end of the pier to Pednolver point.

Supplies, &c.—Supplies in moderate quantities can always be obtained at St. Ives; water is good and plentiful, and can be procured gratuitously by hose from several places round the harbour. The principal imports are corn, salt, timber, bricks, slate, and coals; and the exports copper ore and fish. In 1879 there belonged to the port 59 sailing vessels, representing 4,059 tons. In 1867, 226 vessels of 20,848 tons entered the harbour for shelter. In 1881 the population amounted to 6,504, many of whom find employment in the neighbouring mines, but their principal support is derived from the pilchard and mackerel fisheries; the pilchards are generally exported in a cured state to the Italian market.

LIGHTS.—At about 125 feet from the end of the outer wooden pier at St. Ives, a small *fixed red* light—visible 2 miles only—is shown all night.* A stone lighthouse, 36 feet from the end of the inner pier, exhibits, at an elevation of 23 feet above high water—a *fixed* white light, from the 1st September to 30th April, when there is a depth of 10 feet at the head of the inner pier; the light should be seen in clear weather from a distance of 9 miles, but there is a difficulty in distinguishing it from the lights of the town.

Life Boat.—A life boat is stationed at St. Ives, and a rocket apparatus is in readiness in case of shipwreck.

Anchorage.—Small vessels lie aground at low water in St. Ives harbour, secure from all winds, but vessels of burthen anchor in the bay. The best position is in 9 fathoms, with Battery point N.W. ¼ W., and Knill's monument open to the southward of Porthminster farm S.W. ¾ W.; the bay, however, is completely exposed to northerly winds, which throw in a heavy sea.

Tides.—It is high water, full and change, at St. Ives, at 4h. 44m.; springs rise 21 feet, neaps 15 feet.

Directions.—There is no difficulty in entering St. Ives harbour with a leading wind, but it should not be attempted with a ground swell on, or with gales from seaward. When Merran rock (a detached mass between Battery point and outer pier) is covered, there is a depth of 12 feet into

* The light is now placed inside the gap. *See* page 42.

the harbour. The Hoe rock, off Battery point, as well as the Merran rock —when covered—may be cleared by keeping Knill's monument open to the eastward of the outer pier.

Vessels entering the harbour at night should keep at least 200 feet south of the red light before steering for the stone pier.

BANN SHOAL is a narrow rocky ridge, about three-quarters of a mile in extent N.N.E. and S.S.W., with irregular depths from 8 to 20 fathoms on it. From the least water, 8 fathoms, St. Ives head, or Battery point, bears S.E. ¾ S., distant 12½ miles; and Sennen church, in line with the extreme of the high-water mark at cape Cornwall, bearing S. by W. ¼ W.

CAPE CORNWALL BANK, lying S.W. ½ W. 6 miles from Bann shoal, is a narrow ridge about 3 miles long, N.N.E. and S.S.W., the known depths on it varying from 13 to 20 fathoms; but according to Captain Sheringham, it is deemed probable that on one spot near the north end, the depth is less than 10 fathoms.

Caution.—As the sea breaks heavily in bad weather on both of the above shoals, particularly during north-west gales, their locality should at that time be avoided, especially by small and heavily laden vessels. The coast being so far distant, no good marks can be given for clearing them; but in proceeding round the Land's End to the northward, if the weather be clear, the Longships lighthouse kept on a S. ¼ E. bearing, will lead one mile westward of cape Cornwall bank; the Brisons islets S. by W., or at night the Longships light dipping and bearing S. by W. ¼ W., will lead between the shoals; and cape Cornwall S.S.W. will lead one mile eastward of Bann shoal.

The Coast from St. Ives head curves round to the west and south-west to cape Cornwall, which is distant about 11 miles. From St. Ives to Gurnards head the shore is rugged and indented, the height of the cliffs averaging about 250 feet. To the westward of Carnmen point is a mass of rocks named the Caraks,* the largest of which rises 25 feet above high water; the rest cover at a quarter flood: the outermost rock lies N. by W. ¼ W. 2 cables off shore. From the Caraks, the outermost of the Carlow rocks bears W. by S. ¾ S. distant three-quarters of a mile, and is 2¼ cables off shore; it covers at three-quarters flood.

Gurnards head, 185 feet above high water is rugged and steep, and surrounded by a mass of detached rocks, the largest of which, named the Ebal, lies North nearly one cable from the head, and covers at high-water springs; thence to the Wra or Three Stone Oar rocks, which bear W. ¼ S.

* Carak, carrey, carrack or carrick, is the Celtic name for rock.

3 miles, the cliffs vary from 50 to 100 feet in height. A patch named the Carnellow shoal, with 3½ fathoms on it, lies eastward of Gurnards head, with the north extreme of the Ebal rock bearing W. ½ S., and the northern house of Trereen farm in line with the Old Mine chimney, S.S.W. ½ W. There is also a small rock, with only 6 feet water over it, named the Carnellow, lying one cable S.E. by E. of this patch.

From Gurnards head to Greeb point the coast should not be approached within one-third of a mile, for a small rock, which uncovers only one foot at low-water springs, lies W.S.W., three-quarters of a mile from the Ebal rock, and about 2 cables off shore; and a ledge of rocks extends in a north-easterly direction upwards of one cable from Greeb point. The Mozen rocks lie off Pendeen cove in an E.N.E. direction, and covers at a quarter flood. Their northern extremity bears S.E. by E. ½ E., half a mile from the Three Stone Oar. A rocket apparatus is kept in Pendeen cove in case of shipwreck.

The Three Stone Oar rocks lie one-third of a mile to the north-eastward of Watch Hill point, and do not cover at ordinary springs; the passage between them and the point should not be attempted by a stranger. The three rocks named the Skinvynecks lie 1½ cables off shore in a north-westerly direction from Watch Hill point; the two inner rocks cover at two-thirds flood, and the outer one is awash at low water. The Avarrak rock bears S.W. by W., three-quarters of a mile from the outer Three Stone Oar and covers at half tide. The Manver rock covers at half flood, and lies two-thirds of a cable from Botallack head; and the Coq le Marny rock, which resembles a boat turned upside down, lies one cable in a northerly direction from the head, and also covers at half tide.

The coast from Watch Hill point to cape Cornwall is about 200 feet high, and deeply indented; the cliffs vary from 50 to 100 feet in height, and many of the points at a distance appear like islands. The cliffs from the cape to the Gwynver sands are from 300 to 20 feet high, after which they rise to 190 feet at Gamper point, and then average about 200 feet to Peal point. Off cape Cornwall, one third of a mile, in a N.N.W. ½ W. direction, are a group of detached rocks named the Vyneck, which cover at a quarter flood, and lie with the Longships lighthouse touching the eastern shoulder of the smaller of the Brisons, S.W. ¼ S.

The BRISONS are two rocky islets 90 and 71 feet respectively above high water, lying W. ½ S. half a mile from cape Cornwall, and N.E. ½ N. 3⅓ miles from the Longships lighthouse. Between them and Pol Pry point are various rocky ledges which cover at a quarter flood, and shoal water extends nearly one cable S.W. by W. ½ W. from the lower islet; and at the same distance W. ¾ N. is a small patch of only 16 feet. The two Brisons in line N. ¾ E., leads westward of the Outer Greeb patch

lying south of the islets; and Nanquidno mill open in the valley, S.E. by E. leads to the southward.

WHITESAND BAY is between cape Cornwall and the Land's End, and in the middle of it is Bommber rock with 11 fathoms over it, from which Mathew's house is in line with Sennen church, bearing S. ¾ W. Vessels will ride well sheltered from easterly winds in 12 to 15 fathoms outside this rock, about two-thirds of a mile off shore, with cape Cornwall N.N.E. ¾ E.; but the danger arising from westerly winds makes this bay little frequented.

Sennen Cove is in the southern part of Whitesand bay, within Peden Meandu point, and the seine boats are protected by the rocks without, named the Bo Cowloe and Bo Cat, which are awash at high-water springs. The little Bo or outermost rock covers at half flood, and lies nearly one-third of a mile from the shore, with the point bearing S. ¾ W.

Life Boat.—A life boat is kept in Sennen cove, which is a coast-guard station; there is also a rocket apparatus in readiness in case of shipwreck.

The LAND'S END, or western extreme of England, may be seen in clear weather from a distance of about 25 miles; and when first viewed from the south-westward and southward has the appearance of two detached hummocks. On nearing the land another hummock, with buildings on it, will appear to the westward; then cape Cornwall, and ultimately the whole will form a continuous line of coast. The most conspicuous buildings in the vicinity of the Land's End are, the churches of St. Buryan and Sennen, the former being elevated 488 feet, and the latter 358 feet above high water.*

From Peal point, which is the north-western extreme of the Land's End, the coast trends S. by E. 2¼ miles to Guethensbras point, and the cliffs range in height from 150 to 200 feet. At 3½ cables S. by W. ½ W. from Peal point is the Armed Knight islet, 88 feet above high water; and N.W. ½ N., upwards of one cable from Peal point, are the Peal rocks, awash at low water. A patch of 2 fathoms lies 1½ cables to the north-westward of the Armed Knight, and off all the intervening points to Guethensbras are a number of outlying rocks extending about half a cable off shore, and covering from a quarter to half flood.

LONGSHIPS ROCKS.—About 3 miles N.N.W. ½ W. from Tol Pedn Penwith, or the south-eastern extreme of the Land's End, and one mile W.N.W. from Peal point, is a group of high detached rocks named the Longships, on the largest and most elevated of which stands a light-house, from which the Brisons bear N.E. ½ N. 3¼ miles; the Runnel-stone,

* *See* Admiralty plan, Longships rocks, No. 2,478; scale, *m* = 6 inches.

S.S.E. ¼ E., nearly 4 miles; the Wolf lighthouse, S.W. ½ S. 7¾ miles; and St. Agnes lighthouse W. ¼ S. 25½ miles. The summit of the lighthouse rock is 44 feet above high-water ordinary springs, and from it a ledge extends S.S.E. ½ E. nearly half a mile. The other rocks vary from 44 to 20 feet in height.

At the distance of two-thirds of a mile N.E. by E. ½ E. from the lighthouse lies Sharks Fin rock, which covers at two-thirds flood, and is steep-to, except off its western side, where a shoal, with only 9 feet on it, projects off one-third of a cable. A rocky shoal, named the Ketel Boton lies E. by S. ¼ S. nearly two-thirds of a mile from the lighthouse, and covers at three-quarters flood; shoal water extends one quarter of a mile in a S.W. ½ S. direction from its highest part. Between the Ketel Boton and Sharks Fin is a small rock named the Fe-les, which covers at a quarter flood, and has deep water around it.

LIGHT.—Longships lighthouse, on highest rock, is a circular tower of gray granite, and exhibits at 110 feet above the level of high water a *fixed* light of the first order, which shows *white* seaward between the bearings of S.S.W. ½ W. and N. by W. ¼ W., *red* between the bearings of S.S.W. ½ W. and S.W. ¼ S., and between the bearings of N. by W. ¼ W. and N.W. by N. A *red* light of less power is shown towards the land. The bearing S.S.W. ½ W. leads half a mile westward of the Brisons and the bearing N. by W. ¼ W. leads three-quarters of a mile westward of the Runnel-stone. In clear weather the white light should be visible from a distance of 16 miles.*

In foggy weather a bell is sounded *twice* in quick succession *every fifteen seconds.**

Tides.—It is high water, full and change at the Longships, at 4h. 35m., springs rise 20 feet; neaps 14 feet.

CARN BASE.—The soundings are irregular from two to three miles S.S.W. ½ W. from the Longships lighthouse, and 2¼ miles in that direction, and the same distance off shore, is a rocky patch of 9 fathoms, named the Carn Base, from which Chapel Carn Brea is just open eastward of Sennen church W.S.W.

RUNNEL-STONE.—The two beacons erected at Porthgwarrah near Tol Peden Penwith, when in line, bearing N. by E., point to a rock named the Runnel-stone, which lies three-quarters of a mile from the

* The Trinity House, London, has given notice that it is intended to make the following alteration in the character of the light and fog signal on Longships rocks:—

The light will be an *intermittent* light, having the ordinary appearance of a *fixed* light, varied by a sudden eclipse of *three seconds* duration once *every minute.*

During foggy weather, two explosive reports (each sounding like the discharge of a gun) will be given *every ten minutes;* the interval between the two reports will be *five seconds.*

land, and covers at two-thirds flood. The southernmost or outer beacon is of a conical form, and painted red ; the inner or northernmost has a large extended base, and is coloured black, excepting a small part of the pillar immediately above the base, which is white.*

The rocks in the vicinity of the Runnel-stone are as follows :—The Lee Mean, awash at low water, lies S.E. by E. ¾ E. distant half a cable ; and the Carn-stone, with 8 feet over it N.W. by N. one cable from the Runnel-stone. A rocky patch named the Lee Ore, with 11 feet over it, lies 4 cables N.E. from the Runnel-stone, directly in the middle of the passage between it and the coast, with the Longships lighthouse appearing just open of Guethensbras high-water point, N.W. by N., and a slated shed in line with Peden-mean-anmear cliff, E. by N. ½ N. A rocky ledge of uneven ground, named the Poldew, with 4 fathoms on it, and 8 to 13 fathoms close-to, lies W.N.W. 3 cables from the Runnel-stone.

Bell Buoy.—A boat bell buoy (Sherwell's) is moored in 16 fathoms, about three-quarters of a cable southward of the Runnel-stone, with the beacons near Tol Peden Penwith in line ; no dependence, however, can be placed on the buoy remaining in position, for it often breaks adrift.

DIRECTIONS.—Vessels bound round the Land's End from the eastward will open the Longships light of Tol Peden Penwith when it bears N.W. by N., it will then show *red ;* by keeping it north of a N. by W. ¼ W. bearing and with the *white* light in sight, will lead clear of the Runnel-stone. By day the Longships may, if requisite, be passed at a distance of 2 cables, as the westernmost rock does not lie more than half that distance from the lighthouse. Having rounded the Longships, the white light kept to the southward of S.S.W. ½ W., will lead outside the Brisons. At night a vessel by keeping the white light of the Longships in sight will pass not less than three-quarters of a mile outside the Runnel-stone and half a mile outside the Brisons.

There is a good channel nearly half a mile wide inside the Longships, between the Ketel Boton and Peal point. It carries 8 to 11 fathoms water, but is seldom used except by coasters. The leading mark through is the highest part of the northern Brison appearing westward of the highest part of the southern or lower Brison, N.N.E.

To pass between the Lee Ore and the Runnel-stone, bring the Longships lighthouse well open of Guethensbras point, N.N.W. ½ W., and when St. Levan church opens of the land, the vessel will be south-west of all danger in the vicinity of the Runnel-stone ; the passage, however, between this rock and the land should never be attempted by a stranger. Godolphin hill in line with Carndu point bearing E. by N. leads about two-thirds of a mile south-east of the Runnel-stone.

* *See* Admiralty plan, Runnel-stone, with dangers in its vicinity, No. 2,473 ; scale, $m = 6$ inches.

The Coast from Guethensbras point bends round to the eastward and then runs in an E. ½ S. direction 5 miles to Carndu point. At the distance of 2 miles is Castle Treveen point rock; the cliffs between are 200 to 250 feet high, and the shore forms a number of little inlets. Off Guethensbras point the low-water rocks extend W. ¾ S. nearly 2 cables, the outermost covering at a quarter flood; thence the low-water rock lying one cable off Tol Peden Penwith, bears S.E. one third of a mile. At the distance of 2 cables S.E. by E. ¾ E. from Ella point, is a rock with only 6 feet on it; and at one third of a cable southward of the point is another rock awash at low water. To the eastward of the point there is a bight named Porthgwarrah cove, and off its eastern point, which is the western limit of Por-chapel bay, a ledge of rocks extends S. ½ E. nearly one cable. A rock also lies S.W., half a cable from Peden-mean-anmear point.

Between Castle Treveen and Tetterdu points, the cliff ranges from 100 to 150 feet in height, with the exception of the low rocky shore of St. Loy cove, the western extreme of which is Merthen point. In a S.W. ¼ W. direction from Castle Treveen point are two detached rocks, but the outermost is only one cable off shore; and to the eastward is the high-water rock, named the Seghys. Penberth cove, which is used as a fishing station, is half a mile eastward of Castle Treveen point. From Merthen point the low-water rocks extend upwards of one cable off shore, and West half a mile from Tetterdu point is the Tregiftian rock with only 4 feet water on it; Carndu point open of Tetterdu point, bearing E. ¾ N., leads south of it.

From Tetterdu point, which slopes gradually to cliffs not more than 50 feet in height, to the southern side of Lamorna cove, the land rises abruptly, the cliffs varying from 60 to 80 feet in height, and from 80 to 100 feet on the northern side of the cove to Carndu point, which is only 44 feet high. At nearly 2 cables eastward of Tetterdu point, and at about the same distance off shore, are the Buck rocks, which cover at three quarters flood. The Gull rock, lying off Carndu point, is precipitous, and 80 feet above high water; half a cable W.S.W. of it is a small rock named the Haver, which covers at a quarter flood.

From Carndu point the cliffs decrease in height, varying from 50 to 40 feet, until near Flat point, which is only 20 feet high, when they gradually rise to 60 and 90 feet to Penzer point, which is abrupt; and thence to Mousehole they range from 30 to 40 feet, the high land sloping directly to them. At nearly 2 cables eastward of Carndu point, and about half that distance southward of Flat point, is the Lelland (Rennell) rock, which covers at a quarter flood.

MOUNTS BAY is between the Runnel-stone and Lizard point, which are distant from each other 18½ miles, in a N.W. by W. and S.E. by E. direction. This spacious bay receives its name from the remarkable and picturesque isle, mount St. Michael's, lying at its head; the mount is of a conical form, 263 feet high, and about one mile in circumference, and bears a striking resemblance to the mount of the same name in Normandy. The inner points of the bay are Carndu to the westward and Cuddan to the eastward, bearing East and West, 5½ miles.

There are five tidal harbours in Mounts bay, viz., Mousehole, Newlyn, and Penzance harbours on the western shore of the bay; mount St. Michael's harbour on the northern side of the mount: and port Leven on the eastern shore; but none of them should be run for with a ground swell on, or with gales blowing on the land. The principal anchorage in the bay is in Gwavas lake, off Newlyn harbour.

Both Mounts bay and Gwavas lake afford good anchorage, and are sheltered from all winds, excepting those between S.S.W. and S.E., which send in a heavy breaking sea, against which few vessels could ride with any prospect of success, were it not for the powerful undertow, the resistance of which, as in Torbay, increases with the strength and duration of the wind, thus enabling them to ride easy. In the winter season, however, the bay should not be resorted to, save as a preliminary step, when wishing to enter mount St. Michael's or Penzance harbours.

On the eastern side of the bay are several spots of foul ground, but there are places where the bottom is good, and vessels may lie sheltered from easterly winds. Good anchorage will be found during strong easterly or south-easterly gales on the north-west side of Mullion island, in about 10 fathoms; great care, however, must be taken to guard against a sudden shift of wind to the westward.

There is also good anchorage in 7 fathoms, fine white sand, sheltered from easterly winds, about one mile to the S.S.W. of Loo pool; also in 11 fathoms, hard sand, off port Leven, with Helstone church, N.E. by E. ¼ E., and Cuddan point, N.W. ⅓ N. Between port Leven and mount St. Michael's the coast is foul, with many outlying dangers, and vessels of large draught should not venture into a less depth than 14 fathoms.

Mousehole Harbour, formed by two piers, is 1¼ acres in extent, and sheltered from E.S.E. to S.E. by S. by St. Clements island. The southern pier extends 441 feet in a N.E. by E. ½ E. direction, and is 47 feet wide; the northern pier, only 18 feet wide, runs out curving to the southward to the distance of 228 feet, leaving an entrance between the pier heads of 49 feet. The harbour carries a depth of about 13 feet at high water springs, and 10 feet at neaps, over a bottom of gravel on rocky ground.

The southern passage to the harbour, between St. Clements island and the main, is about 1½ cables wide; the northern passage, also between that island and the main, is foul, and only half a cable wide.

From Mousehole to Penlee point the shore is rugged, consisting of heavy masses of loose rocks; and near the eastern side of the harbour's mouth are some detached rocks, extending nearly three quarters of a cable from the land. The cliffs are only 20 feet high near Mousehole, but increase to 50 and 60 feet near Penlee point, the land rising abruptly to 224 feet, leaving only sufficient space for a roadway; and thence they soon decrease to an average height of 35 feet, the land gradually sloping to them, and this feature continues to Newlyn point, which is about one mile to the northward.

A rocket apparatus is kept in Mousehole harbour.

Low Lee Rock, with only 4 feet water, lies one third of a mile eastward of Penlee point, with the extreme cliff at Penzer point in line with the northern hummock of St. Clements island, S.W. ½ W.; and the tower of St. Paul's church in line with the southernmost new barn, W. by N. ¼ N. A buoy marked with black and white vertical stripes is moored 30 yards north-eastward of the rock.

Carn Base Rock, also with only 4 feet, lies N. ½ W. nearly one third of a mile from Low Lee rock, and about the same distance from the shore. The marks for it are St. Paul's church tower in line with the southern side of the longest hedge, bearing W. ¾ S.; and Trithal engine-house in line with the eastern chimney of the coast-guard house, N. ¼ W.

Low Lee and Carn Base rocks are small in extent, and steep-to.

Dog Rock, with less than 6 feet at low water, lies 2½ cables off shore, half a mile S.W. ¾ W. from the battery at Penzance; from the rock, the east chimney of coast-guard station bears N. ¼ W.

Nelwyn Harbour.—A curving pier, 69 yards long and 5 broad, runs about 27 yards in a northerly direction from the village of Newlyn. The harbour thus formed is about half an acre in extent, carries a depth of 6 feet at high-water springs, and 3 feet at neaps, over gravel bottom, and is capable of containing from 30 to 40 boats averaging 15 tons burthen. The sand dries outside the pier to the distance of 104 feet at the lowest tides.

Between Newlyn and Gwavas Slips, which are 83 yards apart, is Gwavas cliff, about 40 feet high, in the direction of which is the clearest and safest place to beach a vessel; and thence to Tolcarn bridge, a flat, stony shore extends off one cable from high to low water mark. From Tolcarn bridge to the coast-guard house, the rocks, which cover at three-quarters flood, extend 1½ cables off the shingle beach; and thence to the

parade wall at Penzance, they run off the same distance from a sandy shore.

PENZANCE HARBOUR, in the extreme northern part of Mounts bay, is formed by two piers, and the tide rises in it 17 feet at high water springs, and 13 feet at neaps. The northern pier runs out 572 yards in a southerly direction from the inner wall; and on the extremity of the southern pier, which is irregular in shape, an iron lighthouse is erected. The entrance between the pier-heads is 100 yards wide. The harbour is 28 acres in area, and contains one building yard, and a dry dock on its western side.*

The dry dock is 250 feet in length, 40 in breadth, and has 13 feet over sill at high-water springs, and 9 feet at neaps;† cranes are erected on the piers, capable of lifting from 5 to 10 tons. There are 25½ feet at high-water springs at the extreme of the eastern extension of the harbour, and 20 feet at neaps. Abreast the northern pier end there are 16 feet, and the depth decreases gradually to 14 feet at the head of the harbour. In 1881 the number of vessels belonging to the port was 72, representing 6,593 tons and in the same year 769 vessels, representing an aggregate tonnage of 65,958 tons, entered. The population of the town, in 1881, was 11,194.

LIGHT.—The lighthouse on the end of the southern pier of Penzance harbour is 22 feet high, and coloured white. It exhibits at 33 feet above high water a *fixed* light, which shows *red* when bearing from N. ¼ E. round northerly to W. by N. ¼ N., or from about one cable south of the beacon on the Raymond rock, to about the same distance east of the beacon on the Gear rock, when there are 15 feet water at the pier head, which is quite 8 hours out of the 12; the remainder of the circle it shows white. When less than 15 feet, the light shows *green* instead of *red.* The light is of the fifth order, and visible in clear weather from a distance of 10 miles. A ball is hoisted on a pole at the end of the pier by day, when there are 15 feet water at the pier head.

Life Boat.—A life boat, and mortar apparatus are kept in readiness in the boat-house at the coastguard station west of Penzance.

Pilots.—There are 16 Trinity pilots at Penzance. They have no vessel, but are supposed to be always on the look out for ships, on the heights, or in their boats.

Signals.—A signal station is established at Penzance; vessels making their numbers by the commercial code of signals are reported.

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* *See* Admiralty plan, Penzance bay, No. 2,345; scale, $m=6$ inches.

† A floating dock of more than three acres in extent is in course of construction in the south-west corner of the harbour.

Gear Rock.—A rocky ledge known as the Battery rocks, extends one cable S.S.W. of the southern arm of the south pier of Penzance harbour, and at the same distance without them and in the same direction are some detached rocks, which narrow the 4-fathom channel between them and the Gear rock to one cable in breadth. The Gear, on which is an iron beacon, painted black and surmounted by a cage, lies upwards of 4 cables S. by W. ½ W. from the lighthouse, and covers at one-third flood. The marks for it are, the Roman Catholic chapel in Penzance in line with the east end of St. Mary's church N. ¾ W.; and the middle of Trewarveneth clump of trees W. by S. ½ S.

Cressar and Bloon Rocks.—The shore at the head of Mounts bay, from Penzance to the bridge at Marazion, is low and flat, and composed of sand and shingle, which runs off from high-water mark to the Long rock, a distance of nearly 2 cables. Nearly three-quarters of a mile eastward of Penzance harbour, and about one-third of a mile from high-water mark, is the south extreme of the Cressar rocks, which cover at two-thirds flood; their western limit, only 4 cables eastward of the harbour, if marked by an iron beacon, painted red, surmounted by a cage.

The Bloon or Raymond rock lies E.S.E. upwards of half a mile from the beacon on the Cressar, and nearly half a mile from the shore, its north extreme nearly touching Long rock; it is also marked by an iron beacon painted red with a cage.

Hogus Rocks.—The beach eastward of the Long rock extends one cable from high-water mark, and the shore to mount St. Michael's forms a bay, on the eastern side of which are the Penzeath and Hogus rocks. The Penzeath is a small patch lying half a mile eastward of the Long rock at 1½ cables off shore, and covers at one hour's flood. The Great Hogus is a rocky cluster lying upwards of one-third of a mile off shore between the mount and the Penzeath; and the Litttle Hogus, which covers at three-quarters flood, is about one quarter of a mile off shore between the Great Hogus and the Penzeath.

Outer Penzeath Rock, with less than 6 feet over it at low water, lies 3 cables W. ¼ N. from Hogus rocks, and from the rock, the south extreme of mount St. Michael's bears S.E. ¾ S. distant 4¾ cables.

Venton chimney-shaft in line with the end of the western pier of mount St. Michael's harbour, bearing E. by S. ½ S., leads south of the Cressar and Bloon rocks and the shoals without them, in about 3 fathoms, at low water.

MOUNT ST. MICHAEL'S HARBOUR, 2¼ acres in extent, is formed by two piers on the northern side of the mount, and carries a depth of 11 feet at high-water springs, and 7½ feet at neaps. The

—Maltman Rocks must be caref
s approaching mount St. Michael's harbour. The G
t water, lies upwards of one cable off shore in a W
the castle on the mount. The Maltman lies abou
S.W. ¼ S. from the castle, and covers at first-quarter
ı side of the mount, about 2 cables off shore, and E. l
stle, are a small cluster of rocks awash at low water.
on castle in line with the hummock of Greeb rock, bear
outh of the Maltman; and the Virgin Mine in line wi
ock of the Great Hogus, N.E. ½ E. leads west of the G

eeb Rock, 24 feet above high water, and lying be
ichael's and Cuddan point, is separated from the m
ı of rock, which extend in a W. by S. direction from M
er extreme is nearly one quarter of a mile from the sh
ched rock off it. Between Greeb rock and the mou
a small bay, with several shoal patches in it; off its low
the low-water rocks extend three-quarters of a cable, an
ble without them at the several points lie detached rocks.

rs Rock.—From the Greeb, Cuddan point bears
s, the coast between forming a bay, in the northern pa
ter of rocks, named the Bears, which cover at two-th
r rock lies S.E. by E. 1¾ cables from the hummock of t
Maendu point, which is high and rocky, the cl
to a low shore, to the southward of which are the Pe
ce to within one-sixth of a mile of Cuddan point the
r. To the north-westward of Cuddan point is a rc
of the water about 150 feet off shore; and one-third
uthward of the extreme point is the C

rock, and a dry spot on its northern part bears S.E. by S. a short half mile, where the tower of the castle on the mount is in line with the Shag, N.W. by N. To pass north of this shoal, shut the mount tower in with Cuddan point.

Mountamopus Shoal, lying about three-quarters of a mile to the southward of Cuddan point, is 1½ cables long, and nearly one cable broad. From its shoalest part of 5 feet, Acton castle is in line with the hummock of Cuddan point N.E. by N., and Pengersick castle is in line with the extreme of Hoe point E. by N. ¼ N. A black buoy marks its southern edge.

Carn Mallows Shoal has several patches of 3 fathoms on it lying half a mile S.E. from the shoalest water on the Mountamopus. From this part Trebarvah farmhouse is in line with the extreme of Cuddan point, N. ½ E. From the eastern part of the bank, which has 4 to 5 fathoms on it, Perranuthno church tower is in line with the outer saddle of Cuddan point, N. by W.

The sea breaks heavily on the Stones, the Mountamopus, and on the Carn Mallows shoals in bad weather, with the wind from S.S.E. to West.

Iron Gates, the outer shoal off Cuddan point, is a small rocky patch of 4 fathoms, lying S.W. by S. 2 miles from the point, with Acton castle open eastward of the hummock of Cuddan point, N.E, ½ N.; the hummock on the Old Lizard head touching Rill head, S.S.E. ¾ E.; and Mountamopus buoy N.N.E. Trithal engine-house in line with the Roman Catholic chapel at Penzance, N. by W., leads one mile westward of this shoal. Between the Iron Gates and the Mountamopus there is a good channel three-quarters of a mile broad, carrying a depth of 6 to 10 fathoms. The mark to lead through is Rogers tower, or Castle an Dinas in line with the mount tower, bearing N. by W.

Ludgvan church in line with the mount tower N. ¼ E., or Acton castle open westward of Cuddan point N.E. ¼ N., leads westward of all the shoals off Cuddan point; and Trigoning signal hill open eastward of the town of Trewavas N.E. leads eastward.

Welloe Shoal lies two-thirds of a mile S.W. ¾ W. of Rinsey beacon, and upwards of half a mile from the cliff immediately below the beacon. From the part which dries 5 feet at low-water springs, Bessys house (in the first bight westward of Prussia cove) is in line with the Ynys rock, N.W. by N.; and Trewavas farmhouse is in line with Rinsey mine counting-house N.E. by E. The hummock of Cuddan point on with the mount tower, N.W. ¾ N., leads south of this shoal.

Great Row Shoal, lying upwards of one mile S.W. ¾ W. of the Welloe, has only 3 fathoms on it, and foul and uneven ground on all

sides. The marks for it are, Trewavas farmhouse on with the south gable of Rinsey mine counting-house, N.E. ¾ E.; and Perranuthno church tower in line with the inner saddle of the Cuddan, N. by W. ¼ W. Madron union on with the Roman Catholic chapel at Penzance, N.W. by N., leads south-west of this shoal; and Trigoning hill open eastward of Trewavas farmhouse, N.E., leads south-east.

Prussia Cove.—From Cuddan point the cliffs do not vary until near the Ynys rock, three-quarters of a mile to the eastward, when they turn inwards to the bight, and gradually decrease in height to the low point near the coast-guard station in Prussia cove, which is between the Ynys and Hoe point; the shore of this cove is composed of sand and scare,* and extends off nearly one cable from the bight. The cliffs from the coast-guard to Hoe point are 65 to 50 feet high, and again terminate in the bight which forms the north-west part of the Pra sands. From the eastern limit of Prussia cove to the end of the cliffs at the north-west part of these sands, are a series of high detached rocks extending some distance off shore; those off Hye point lie nearly one cable from the cliff.

A rocket apparatus is kept in Prussia cove.

PRA SANDS.—From Hoe point the land to the eastward continues low for two-thirds of a mile, forming between that point and Rinsey head a small bay bordered by the Pra sands, which extend off 1½ cables to low-water mark. From the eastern termination of these sands the cliffs increase in height, Rinsey head being 80 feet above high water, and continue with little variation until they reach Trewavas head, which slopes to seaward to a cliff 35 feet high.

A short distance south-eastward of the Pra sands the shore is composed of heavy masses of loose rocks, which extends off nearly two-thirds of a cable; and thence to Trewavas head the low-water rocks are shelving and diverge from the cliffs, except in the two bights to the south-eastward of Rinsey head; the one close to the head having scare running off one-third of a cable from the shore, and the other having flat rocks within, and sand without, extending off half a cable to low-water mark.

At 1½ cables from Trewavas head and one-third of a cable off shore is a sunken rock; and thence to Port Leven, which is nearly 1¾ miles S.E. of the head, the cliffs rise to about 150 feet.

PORT LEVEN.—The entrance to this tidal harbour is 240 feet wide, and is formed between the end of the pier, which extends off 137 yards in a westerly direction, and the Deazle rocks, which cover when the tide has risen 2½ feet at springs. At 1¼ cables within the entrance, the

* Scare, scar, skain, or sgein, on the English, Irish, or Scottish coasts means rough rocky ground.

harbour curves to the northward, and the distance between the outer pier-heads is 134 feet. At 73 yards farther in are the inner pier-heads, with gates 32 feet wide. The entrance is directly open to the westward, and balks of timber are lowered to protect the gates if required. There are 6 feet at low-water springs between the end of the pier and the Deazle rocks; and thence the bottom rises, and on the gate sill there are 13½ feet at high-water springs, and 10 feet at neaps. The exports are, china clay, copper, tin, and fish; the imports, coal and timber.

LOO POOL, about one mile south of Port Leven, is sometimes mistaken for the latter. It forms a deep inlet of retained water, the entrance being blocked up by a bar of shingle 34 feet above low-water springs.

From port Leven the coast is low to Loo pool, after which the cliffs vary from 50 to 200 feet in height, the shore between continuing sandy to within two-thirds of a mile of Pedngwinion head; and thence to Pradanack point the cliffs are 100 to 200 feet high, and the low-water rocks extend about half a cable off shore. A rocky patch, awash at low-water springs, named the Viziers, lies N.W. by N. nearly 2 cables from Pedngwinion head, and about one cable from the shore. The Vradden rock lies awash at low water in a W.N.W. direction about 2 cables from Pradanack point.

MULLION ISLAND, one quarter of a mile north-east of Pedncrifton point, rises 118 feet above high water, and is precipitous on its W.N.W. side. There is good anchorage on its north-west side in strong easterly or south-easterly gales, in about 10 fathoms, with the island bearing S. ¼ E., and Mullion church E. ¾ S.; but every preparation should be made to weigh if the wind shifts to the westward.

Life Boats.—A life boat is stationed at port Leven, and there is also one at Mullion.

RILL HEAD.—From Pradanack point to the Lizard the cliffs are 250 to 200 feet in height, and between them is Rill head, off which are several detached rocks. About half a mile south-eastward of the head and close in shore is Kynance island, within which to the eastward is Kynance sandy cove.

The Boa is a rocky shoal of 6 fathoms water which breaks heavily in S.W. gales. From it Rill head bears E. ¼ S., distant 1½ miles; the Lizard S.E. byE. ¼ E. 3 miles; the eastern Lizard lighthouse is in line with Old Lizard head S.E. by E.; and the western extreme of Mullion island is in line with Pedncrifton point N.E. by N.

DIRECTIONS.—Approaching the coast between the Land's End and the Lizard from the offing, the soundings will decrease in tolerable regu-

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h the shore may be approached to a quarter of a mil
lements island, bring Trithal engine house in line
W., and it will lead eastward of the Low Lee and
best anchorage is in about 9 fathoms, with the tow
ael's in line with St. Hilary church spire bearing E
n on the Gear rock in line with the pier lighthous
anchorage for coasters is farther to the westward in
4½ fathoms, with the centre of St. Clements isla
e point, S. by W. ½ W.

approaching the bay from the southward, when betwe
an points, and proceeding in the line towards Gulval
ay, the soundings will gradually decrease from 20 to
water. In the latter depth, which is nearly 1½ miles f
to the westward for the anchorage.

t **Night,** the white light on Penzance pier will open
of Mounts bay when entering from the westward.
ard till the *red* or *green* light—*red* or *green* acc
of water at the pier-head (*see* page 52)—comes i
n limit of the *red* or *green* light is an excellent m
into the bay from the westward, as it leads eastwar
d Carn Base Rocks, which have only 4 feet water on
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Bloon or Raymond, and Cressar rocks in the norther

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CHAPTER III.

LIZARD HEAD TO START POINT.

VARIATION IN 1882.

Falmouth - - -	20° 30′ W.	Plymouth sound - -	20° 10′ W.
Fowey harbour - -	20° 20′ W.	Start point - - -	19° 50′ W.

The Coast.—The land between the Lizard and Start point is, generally speaking, moderately high, and being for the most part double, exhibits a great variety of elevation to a vessel in the offing as she varies her position. It also contains many deep openings between Helford and Looe, which at a distance seem to destroy the connexion. At 9½ miles north-east of the entrance of Falmouth, and nearly midway between the Lizard and Rame head, the Dodman stands out boldly to seaward; it is a precipitous bluff 300 feet above the sea, its steep face being towards the east, and declining gradually to the westward. Gribbin head to the westward of Fowey, and immediately succeeding the deep bight of Polkerris, is distinguished by a beacon tower 84 feet high, standing on an elevation 250 feet above high water; and thence to Looe the land continues high and irregular; rather declining towards Whitsand bay, but rising again in the vicinity of Plymouth.

LIZARD HEAD is a bold and precipitous promontory, whence vessels generally take their departure on leaving the Channel, and use as a landfall when homeward bound. In clear weather it will be seen about 24 miles distant, and be readily known by its two white lighthouses. A vessel may approach it with confidence by night as well as by day, if the weather be at all clear, remembering, however, that the dangers in its vicinity extend off nearly half a mile.*

Signals.—A signal station has been erected on Beast point, about three-quarters of a mile east of the Lizard lighthouses, for the convenience of vessels wishing to communicate by signal. Advices signalled will be forwarded to their destination by telegraph.

LIGHTS.—The lighthouses on the Lizard are 61 feet high, and 74 yards apart on a W. ¾ N. and E. ¾ S. bearing. They each exhibit, at an elevation of 230 feet above the level of high water, a *fixed* white electric

* *See* Admiralty charts; England, south coast, sheet 1, Trevose head to the Dodman, No 2,565, scale $m=0{\cdot}5$ inch; Approaches to Falmouth, No. 154, scale $m=2{\cdot}0$; also Lizard and adjacent rocks, No. 2,447, scale $m=$ 6 inches.

light, visible in clear weather from a distance of 21 miles, and when in line bearing W. ¾ N., they lead 3¾ miles south of the Manacles rocks.

Fog Trumpet.—During thick or foggy weather, one blast will be sounded *every five minutes* from a siren trumpet established at the Lizard.

A Life Boat is placed at Polpear point, about one cable westward of the Lizard lighthouses.

The Stags.—The cluster of rocks, commonly known as the Stags, lying to the south-westward and southward of the Lizard, embraces the Mulvin, the Man-of-War, the Carligga, the Maenheere, the Ennach, and the Crenval. These rocks extend nearly half a mile from the coast, have from 5 to 9 fathoms close to and among them ; and within them, are masses of detached rocks nearly joining the shore.

The Mulvin covers at high-water springs, and bears W. ¾ N. distant two-thirds of a mile from the lighthouses. The Man-of-War rocks bear W. ¼ N. nearly the same distance from the lighthouses, and S. E. ½ E. 1½ cables from the Mulvin. The Carligga bears S.W. by W. ½ W., and the Maenheere S.W. ½ S., nearly half a mile respectively from the lighthouses, and N.E. and S.W., distant 1½ cables from each other; they cover at three-quarters flood, and within them are patches of detached rocks nearly joining the shore. The Ennach lies nearly 1½ cables north-eastward of the Maenheere, and covers at half flood.

The Vrogue Rock is dangerous, with only 6 feet water, lying S.E. ¼ E. distant 4 cables from Beast point. Three beacons, painted red, have been erected on the land to mark its position ; one beacon is on the Balk, and the two others, 8 feet high and 96 yards apart, are on Beast point. From the rock, Ruan Minor church tower is in line with the western ridge at the entrance to Cadgwith, N. by E. ½ E.; the beacon on the Balk bears N. by W. ½ W., distant 8½ cables, and is in line with the middle hummock (whitewashed) on Hot point ; and the two beacons on Beast point are in line bearing N.W. ¼ W.

Clearing Marks.—The Balk beacon in line with the extreme of Hot point N.N.W. nearly leads one cable north-east of the Vrogue ; and Polpear point open of the Bumble, W. by N. ¾ N., leads the same distance to the southward.

Spernan Shoals are rocky patches of 5 fathoms lying eastward of the Vrogue. From the eastern or outer patch, the lighthouses on the Lizard bear W. by N. distant nearly 1½ miles (the top of the western lighthouse is just showing south of the eastern one); Hot point N.W. ¼ W. three-quarters of a mile ; and Treleague house is in line with the western face of Cadgwith cliff, N. ¼ E.*

* *See* views A and B and on Admiralty plan, Lizard and adjacent rocks, No. 2,477.

Craggan Rock with only 5 feet water lies S. ½ W., nearly two-thirds of a mile from Cadgwith cove, with Beast point bearing S.W. ½ W. nearly one mile; Landewednack church W. ¾ S.; and Treleague house in line with the western face of the entrance to Cadgwith. A small rock, named the Va, lies off Perran Vose cove; it is distant 2 cables S.E. ½ E. from the Balk beacon, and covers at 3 feet flood.

Clearing Marks.—Godolphin hill, in line with Pradanack point, or Pradanack point open westward of Rill head N. ½ W., leads one-third of a mile westward of the Stags; and Ynys head, or the beach at Kennack cove, kept in sight eastward of Beast point, about N.E. ¼ N., leads nearly half a mile eastward. But to avoid all the shoal water off the Lizard, keep Godolphin hill open of Rill head N. ½ W., until Lowland point opens of Black head, N.E. ¾ E.

TIDAL STREAMS.—It is high water, full and change, at the Lizard, at 5h. 0m.; springs rise 14¼ feet, neaps 10½ feet. At the Eddystone at 5h. 15m., the rise 16 feet and 12 feet. At the Start at 5h. 41m., the rise 15 feet and 11½ feet.

At the Manacles the stream begins to run to the S.W. at two hours ebb by the shore; when meeting with the stream out of the bight between Cadgwith and Black head, (which sets to the eastward from half ebb till five hours flood,) they unite, and both set to the south-east. But at two hours flood the stream at the Manacles again begins to turn, and the south-east line of direction is warped more easterly until high water, when it ceases altogether.

Off the Manacles the stream runs to the westward until nearly half flood by the shore at from 1 to 1½ knots per hour.

Abreast of Plymouth Sound, about 6 miles from the land, the streams are very irregular. About 1¾ hours before high water at Devonport the stream makes to the eastward, and runs for an hour about E. by S.; during the next hour it is scarcely sensible, after which it turns to the southward, gradually changing to W.S.W. till the last quarter ebb on the shore, when it veers from W.S.W. to W.N.W. During the first three hours flood on the shore, its direction changes from W.N.W. to N.W., when it begins to slacken, and set about North, till at the last 4½ hours flood it runs E. by S. as at first. The maximun velocity of either stream does not exceed 1½ knots.

Four miles south-west of the Eddystone the stream begins to run E. by S. when it is high water at Devonport, and continues about 2¾ hours, when it slacks and shifts to the southward. At 3¼ hours ebb on the shore it sets W.S.W.; at 4 hours W. by N.; and then W.N.W. until low water. During the first 2 hours flood on the shore the stream sets

N.W. to W., and loses its strength during the third hour, running N.W. and North. During the fourth hour, what little stream there is sets N.N.E. and N.E. and then E.N.E. and E. by N. till about high water, when its [illegible] S. by S.

From Bolt head to the Start point, at 4 miles off shore, at springs, the eastern stream makes three hours before high water, and the western stream 3 hours after high water on the shore; the stream sets along the land, and its greatest velocity is 2¾ knots. At neaps the turn of the stream is irregular, varying from 4 to 7 hours after high and low water on the shore, the average being 5 hours. Its rate at neaps is 1½ knots; but off the Start 2½ knots.

Ripplings.—South of the Stag rocks there is always an extensive rippling in both streams of tide, stretching as far seaward from the rocks as 2 or 3 miles; this is chiefly occasioned by the unevenness of the ground, and when it blows strong from seaward during spring tides, the sea is short and violent.

There is another extensive race or rippling to the south-east of the Lizard, but it is occasioned by the confluence of the tides.

DIRECTIONS.—The course from the Lizard to the Start is E. ½ S., [illegible] miles. When navigating this portion of the Channel, [illegible] water than 42 fathoms, a vessel will pass at least [illegible] the Eddystone, the parallel of which will not be [illegible] westward of that rock so long as that depth is [illegible] the Eddystone there are from 34 to 37 [illegible] depth consist of coarse and fine sand, [illegible] greenish muddy sand, and extends nearly [illegible] miles in a southerly direction, from the [illegible] extremity of this muddy sand the steeple [illegible] westward of the summit of Rame head, and [illegible] N.N.E. ½ E.

[illegible] during the night, the lights kept [illegible] point,* about W. ½ N., will lead 1¼ miles [illegible] head, and [illegible] to the Eddystone. In thick weather [illegible] the depth of 47 fathoms, which water will be found only [illegible] miles distance from it.

The Coast from the Lizard trends E. by N. ½ N. 5 miles to Black head and then N.E. ½ E. 3½ miles to Manacle point. Between the Lizard and Kennack cove the cliffs, from 150 to 200 feet in height, termi-

* This promontory forms the eastern part of the land at the Lizard, and being considerably higher than the Lizard lighthouses, excludes the view of the lights from vessels if they approach nearer to Black head than the distance of 1¼ miles.

nate in a low sandy bight; they then rise abruptly to 200 feet, and so continue to Black head, which is 218 feet above high water. Between the Lizard and Black head are several coves, named Housel, Perran Vose, Cadgwith, and Beagle, which are occasionally frequented by coasters in strong northerly winds.

Life Boat.—A life boat is stationed at Cadgwith.

Between Cadgwith and Kennack coves the shore must not be approached within the distance of 2 cables, as it is bordered with outlying rocks which cover from a quarter to three-quarters flood. A small rock named the Bo, lies in the entrance to Cadgwith, and covers at a quarter flood. A mass of rocks, named the Caerverrack, extends 1¼ cables in a southerly direction from the Kennack sands, and their outer part covers at half flood. At about half a mile distant from the Karak-clews rock, on a line between it and the Caerverrack, and nearly one-sixth of a mile off shore, is the Jay rock, which covers at two-thirds flood. From the Karak-clews to Black head, the chief outlying rocks extend in a southerly direction two-thirds of a cable from Pedn Boar point, and cover at a quarter flood.

A group of high rocks, part of which never cover, extend from the shore about one cable South from Black head, and at their outward extreme is a small detached rock which covers at a quarter flood. Between Black head and Chynhals point, the low-water rocks project off shore upwards of one cable, and also in a southerly direction to one-sixth of a mile from that point; to the eastward of the point, and about one cable from the shore, lie the Guthens rocks, which cover at high water. From Black head to Chynhals point, which projects to the eastward, and is elevated 92 feet above high water, the cliffs are about 200 feet high; but thence to Lowland point they are only 10 or 20 feet high, with a ridge of land rising abruptly to 300 feet at the back.

About half-way between the pier at Coverack cove and Lowland point, is a patch of rocks named the Peny-maen which extend upwards of one cable in a southerly direction from the shore, and cover only at the highest tides; rocks continue to range from one to 1½ cables off shore, until abreast of the Great Wrea, and without these are three outlying rocks named the Dava, the Oar, and the Little Wrea.*

The Dava covers at half-flood, and from it the Carndu Manacle is in line with the Little Wrea, bearing E.N.E. The Oar bears N.E. by E. ¼ E. 1½ cables from the Dava, and also covers at half-flood. The little Wrea covers at high water, and lies S.E. by E. 2 cables from Lowland point; and at one-third of a cable from it, in the same direction, is a sunken rock

* *See* plan of Manacle rocks, on Admiralty chart, No. 2,473; scale, $m=6$ inches.

[illegible]

Gillans Creek, [illegible] Helford, [illegible] is a rock which dries [illegible] The [illegible] house [illegible] the southern shore near F[illegible], open, bearing W. ½ S., leads [illegible] the northward of the rock ; and the same house [illegible] to the southward. Within Erra point there are only 2 feet at low-water springs.

Swan Pool.—From Rosemullion head to Pennance point the cliffs are 20 to 50 feet high, and half way between the points is a sandy cove named Maen Porth. From Pennance point to Pendennis point the coast is irregular, the cliffs continue about the same height ; and the low-water rocks, which are shelving, extend nearly one cable off shore. In the bight to the northward of Pennance point is a space of retained water named Swan-pool.

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* *See* Admiralty plan, Helford river, No. 147 ; scale, $m=4$ inches.

FALMOUTH HARBOUR affords capacious and secure anchorage, and is chiefly used as a port of call, as well as for shelter. Its entrance may be easily recognised by St. Anthony point to the eastward marked by a lighthouse, and by Pendennis castle on the western side, which stands on an elevation 233 feet above high water. The entrance is one mile wide, but is divided into two channels, by Black rock, which lies E. by S. one-third of a mile from Pendennis point.*

The eastern channel between Black rock and the lighthouse is the best, as it is the wider of the two and carries the deepest water; with the wind at East a vessel can sail in free on the starboard tack, and at W.N.W. on the port tack. The western channel is only $2\frac{1}{4}$ cables wide, but as the least depth in it is 20 feet at low-water springs, it can be navigated by vessels of large draught at half tide; with the wind at N.W. by W. a vessel will sail in free on the port tack, and although the high land of Pendennis may cause it to baffle, yet there will be no danger when she has shot within the Black rock.

The harbour extends to the northward about 4 miles from the entrance, as far as Pill creek and its shores are indented by several inlets quite landlocked. About $4\frac{1}{2}$ miles from Pill creek is the city and port of Truro, whose population in 1871 amounted to 11,000; spring tides rise at the quay $9\frac{1}{2}$ feet, and neaps 7 feet.

The trade at Falmouth is in corn, flour, potatoes, cattle, &c. In the year 1881, there were 126 vessels, and 78 registered fishing boats as belonging to the port. 925 vessels, of an aggregate tonnage of 131,740, entered the port—exclusive of 1,808 vessels which put in windbound—whilst annually about 2,500 vessels call for orders. In 1881 the population amounted to 14,085.

Docks.—An outer or tidal harbour is partly formed, and two graving docks and a gridiron are constructed on the southern shore of Falmouth harbour, about half a mile from the town. One of these docks is 350 feet long, and 50 feet wide at entrance, has 14 feet water over sill at springs, and 11 feet at neaps; the other, 400 feet long, 65 feet wide at entrance, and 16 feet over sill. There are also two patent slips. Spacious quays are built, and the railway is brought down to the docks.

The tidal harbour, 42 acres in area, will be formed between two piers or breakwaters, and the entrance, 500 feet wide between the pier-heads, will face the north-east. A portion of the harbour and also a channel leading to the east end of the breakwater has been dredged to 18 feet at low water, or 34 feet at high-water springs. The eastern breakwater, 1,400 feet long, is completed, and a depth of 22 feet has been made by dredging along its wharves at low-water springs.

* *See* Admiralty plan, Falmouth harbour, No. 32; scale, $m = 3{\cdot}8$ inches.

[redacted]

If desirous of anchoring in St. Just pool proceed on until Budock church comes over the rising ground of Trefusis point, or the tower of the Meteorological observatory just open south of Falmouth church about W. by S. ½ S.; either of these marks will lead through Cross road, until St. Kevern church comes over Pendennis point S.W. ½ S., when anchor in St. Just pool in 12 to 15 fathoms, mud.

If the weather be hazy and these marks cannot be seen, give St. Anthony point a berth of one quarter of a mile, and run in, keeping the land at St. Mawes about a point on the starboard bow, and then steer for Mylor point. Do not approach the land of St. Mawes nearer than 2 cables, nor St. Mawes bank within a depth of 9 or 8 fathoms. In beating in give the rocks off St. Anthony point a good berth, and if the ship is of large draught do not approch Black rock nearer than 1½ cables.

Entering the harbour by the western channel, keep midway between Pendennis point and the 17-feet patch lying 1½ cables S.W. ½ S. from the beacon on the Black rock; and when the beacon and lighthouse are in line, steer for St. Mawes castle until Killiganoon house comes on with Mylor point, bearing North, when proceed as before.

To work out of this harbour large vessels should weigh on the latter part of the flood, or a little before high water, and before half ebb they will be out of the harbour and half way to the Manacles. As the ebb sets to the westward towards Helford, a vessel when clear of the entrance should not stand farther westward than the meridian of Pendennis point, keeping the entrance open for the benefit of the harbour tide.

The Coast from Zoze point on the eastern side of the entrance of Falmouth trends, E. by N. 1½ miles to Killygerran head, between which and Dodman point, which bears E. ½ N. 8 miles, are two bights, named Gerrans, and Veryan bays, separated by Penare head, a bold headland 260 feet above high water.

Gerrans bay, between Killygerran and Penare heads, is 3½ miles wide and 1½ miles deep, and and the soundings from 15 fathoms in the offing gradually decreases to the shore. Gerrans church stands on the western coast of the bay, and is conspicuous from the offing; the top of its spire being 254 feet above high water. From Killygerran head the cliffs are only 20 to 40 feet high as far as the eastern side of Pendowa beach at the head of Gerrans bay, whence they gradually rise to Penare head; at low water the rocks dry one cable off shore.

Veryan bay, between Penare head and Dodman point, is 4⅔ miles wide and 1½ miles deep; the shore is cliffy, from 20 to 200 feet high, and forms a number of bights.

Dodman point is a precipitous bluff elevated 363 feet above the level of high water, its steep face being towards the east and declining gradually to the westward.*

Life Boat.—A life boat is stationed at Porth Looe in Veryan bay.

Bizzies Shoal.—Nearly one mile north-east of Killygerran head is Greeb point, off which shoal-water, with 3½ to 7 fathoms, extends in a

* *See* Admiralty chart, England, south coast, Dodman point to Portland, No. 2,620; scale, $m = 0{\cdot}5$ inches.

south-easterly direction nearly one mile, where it terminates in a shoal of 3½ fathoms named the Bizzies, from which Trewince house is in line with the east end of Roseteage house bearing N.W. ½ W., and the white coast-guard house in Veryan bay, is on with the south-east extreme of the Gull rock, bearing N.E. by E. ½ E.

Trewince house open west of Roseteage house N.W. ¼ N. leads westward of the Bizzies; Trewince house, bearing N.W. by W. ½ W., leads northward; and the white coast-guard house open south-east of the Gull rock, N.E. by E. ¼ E., leads to the southward.

Gull Rock, elevated 125 feet above high water, lies 6 cables E.S.E. of Penare head, and 3 cables from the nearest shore. There is a clear passage between the rock and the land, the least water being 20 feet.

The Whelps, are detached rocks lying in a S.W. ¼ S. direction from the Gull rock. The outer and highest Whelp is distant 3 cables from the Gull, and covers at three-quarters flood; between it and the middle Whelp which lies 1½ cables from the Gull, there is a passage of 3½ fathoms water; both rocks may be approached to half a cable. A small rock, which covers at a quarter flood, lies in a S.W. direction, distant 100 feet from the outer Whelp, and from it Pendowa lime-kiln is seen touching Penare head, bearing N.W. ¾ N.

The above lime-kiln, open west of Penare head, N.N.W. ¾ W., leads westward of the Whelps; and Porth Looe flag-staff, open south-east of Gull rock, N.E. ½ N., leads to the south-east.

Lath Rock.—Off the fishing village of Porth Looe, and about 1½ miles E. by N. from the Gull, is a small rock named the Lath, with only 7 feet over it, and deep water around. The rock lies with Gerrans church in line with the extreme of Penare head, bearing W. ¼ S., and Porth Looe flag-staff N.N.W. ¾ W. Gerrans church appearing about half the distance between Penare head and Gull rock, bearing West, leads sonth-east of the Lath; to pass in-shore of the rock, keep the church shut in with Penare head.

Ripplings.—The soundings for the distance of one mile, S.W. by S. to S. by E. from Dodman point, are irregular, varying from 10 to 5½ fathoms, and cause heavy overfalls in bad weather; it will therefore be prudent, when passing the point at that period, to give it a berth of 2 miles, where the sea will be regular and the depth 30 fathoms. The marks for the shoalest water, 5½ fathoms, are Gerrans church open south of Gull rock. W. ¾ N., and the flag-staff on Dodman point, N. by W.

The Coast from Dodman point trends 1¼ miles to the north-east to Lanledra point, and between is a bight, around which the cliffs are about 100 feet high. Lanledra point is only 20 feet high and, extending

1½ cables off it in an E. by S. direction, is a group of rocks named the Western Oar, which cover at a quarter flood; and hence the coast turns abruptly to the northward, forming a bight, and then eastward to Chapel point, which is low. In this bight the cliffs are high, sloping seaward, and in its western corner is a small sandy cove, named Gorran haven, having on its south-east side the remains of a pier.

From Chapel point the day mark on Gribbin head bears E.N.E. distant 5 miles, and between are Mevagissey, St. Austell, and Tywardreath bays. Vessels will find good shelter from south-west gales in the bight of Mevagissey bay, in 7 to 10 fathoms, sandy bottom. They will also lie well sheltered in St. Austell bay, by anchoring in its southern part off Rope Hawne in 6 fathoms, stiff clay. Tywardreath bay affords shelter from easterly gales in 5 fathoms, sandy bottom, between Polkerris harbour and little Gribbin point.

The coast from Chapel point turns abruptly to the north-west, and at the distance of two-thirds of a mile is the sandy cove of Portmellin, in which there is a small fishery establishment; one quarter of a mile farther north is an inlet, at the head of which is the town and harbour of Mevagissey. Thence the coast trends in a north-east direction half a mile to Pen-nare point, and then north the same distance to a sandy beach, which extends across a bight, in which is Pentuan tidal basin. The shore from Pentuan again becomes cliffy, and bends round to the eastward about 1¼ miles to Black head, which is bold and steep-to.

Gwineas Rock, lying E.N.E. 2 miles from Dodman point, and S. ⅓ W. two-thirds of a mile from Chapel point, is elevated 26 feet above high-water springs, and appears black. At 1½ cables S.E. by E. ¼ E. from the highest point of the Gwineas is the Yaw rock, which dries 3 feet at the lowest tides.

The passage between the Gwineas and Turbot point,—which is half a mile to the south-west of Chapel point,—is narrowed to one-third of a mile by a rocky patch of 11 feet water lying S.S.E. one cable from Turbot point. The channel between this patch and Gwineas rock carries a depth of 5 to 7 fathoms.

MEVAGISSEY HARBOUR is formed by two piers, whose heads are 106 feet apart. Its area is about 3½ acres, the quayage 230 yards, and there is one building yard. This harbour affords good shelter to vessels that can lie aground, but during south-east gales a great run sets in, causing them to strike heavily in taking the ground. The bottom dries 1½ cables without the pier heads at the lowest tides. There are 14½ feet in the centre of the harbour at high-water springs, and 10 feet at neaps; at the entrance between the pier heads there are 15½ feet at springs, and 11 feet

at neaps. A large mackerel and pilchard fishery is carried on here during the season.

Life Boat.—A life boat is stationed at Mevagissey.

Tides.—It is high water, full and change, in Mevagissey harbour, at 5h. 4m.; springs rise 15½ feet, neaps 12 feet.

PENTUAN TIDAL BASIN is on the eastern side of the beach at three-quarters of a mile northward of Pen-nare point. The entrance is secured by gates 28 feet wide, the sill of which is 2½ feet above low-water ordinary springs. These gates are protected from the southward by a pier running off about 177 yards from them in a south-east direction, and they are farther secured by balks of timber, during south-east gales. The basin has 300 yards length of quays, and carries 14 feet at high-water springs, and 10 feet at neaps.

The sand dries out upwards of one cable from the entrance at low water, and during south-east gales the water on the bar varies from 3 to 4 feet. A vessel should never attempt to run for the harbour at this period, or with a ground swell on, or with a gale blowing on the land. A warping buoy is moored in 11½ feet at low tide about 1½ cables S.E. from the end of the pier.

The exports from this place are china clay, and granite. There is a railway about 4 miles in length connecting it with St. Austell.

CHARLESTOWN HARBOUR, formed by two piers in the northern part of St Austell bay, is capable of accommodating 15 vessels of 150 to 200 tons burthen, but like Pentuan, it would not be prudent to run for it with a ground swell on, or with a gale blowing on the land. At its head there is a small tidal basin three-quarters of an acre in extent, secured by gates 27 feet wide. The harbour is one acre in extent, 53 feet wide between pier heads, has 317 yards length of quayage, and dries out 200 feet from the entrance at the lowest tides. There are 14 feet between the pier heads and over sill of basin at high-water springs, and 10 feet at neaps.

Two warping buoys are moored 1½ cables outside the entrance of the harbour; one in 8 feet at low water S.E. by S., and the other in 10 feet S. ½ W. from the entrance.

PAR HARBOUR is formed in the north-east part of Tywardreath bay by two piers, the outer one of which runs off 347 yards in an easterly direction from the land, and protects the harbour from the sea with southerly winds. The entrance between the piers is 125 feet wide, and in it there are 14 feet at high-water springs and 10 feet at neaps, which depths continue all through the channel of the harbour along the inner pier, alongside which there is space to berth 30 vessels of 100 to 200 tons burthen.

The area of the harbour is 26¼ acres, and the length of quayage 557 yards. The sand dries 1¾ cables S.S.W. from the entrance at the lowest tides, also out to the Callyvardor rocks, which lie S. by E. ¼ E. one-third of a mile from the outer pier end; these rocks have an iron beacon erected on their west extreme, are 500 feet in extent, and cover at a third flood. An active pilchard fishery is carried on at Par during the season, and a great quantity of china clay, copper, iron, and tin ore is shipped to Swansea and the potteries.

POLKERRIS HARBOUR is also in Tywardreath bay, S.E. three-quarters of a mile from the entrance of Par. It is only one quarter of an acre in extent, and open to the westward, but it is sheltered from that quarter by a pier, which extends 100 yards from its south side, curving to the northward; the length of quayage is 70 yards. The bottom dries out 30 yards from the pier at the lowest tides, and the tide rises in the harbour about 14½ feet at high-water springs, and 10 feet at neaps.

GRIBBIN HEAD may be easily recognised by its day mark, a square beacon tower 84 feet high, with red and white horizontal stripes, and standing on an elevation 250 feet above high water. The head is bordered by rocks on which the sea breaks heavily in bad weather. At one quarter of a mile from the nearest shore, and in a S.E. ½ E. direction from the beacon, is Cannis rock, which covers at three quarters flood; between it and the land there is a narrow passage with 9 feet water. Little Gribbin point, the south-east extreme of Tywardreath bay, has rocks extending nearly one cable off it.

FOWEY HARBOUR is at the entrance of the river Lostwithiel which trends to the northward, and is navigable at high water for 5½ miles to the town of Lostwithiel. The entrance, which is 9 miles E.N.E. of Dodman point and 1½ miles eastward of the beacon on Gribbin head, is little more than one cable wide, and may be easily recognised by the high land on either side, and more particularly by the ruins of St. Saviour's church on the eastern side, and the old mill on the high ground on the western side; the church stands on an elevation of 195 feet, and the mill 245 feet above high-water springs. The town of Fowey stands on the right or west bank of the river, half a mile within the entrance; and the village of Polruan in a small bight, just within the eastern point of entrance. The shores are well wooded for a long distance above the town.*

The ingress and egress of this harbour being in a N.E. by E. and S.W. by W. direction, gives it an advantage over many along the coast, as outward bound vessels can leave it with a S. by E. wind, and coasters,

* *See* Admiralty chart, Fowey harbour, No. 31; scale, $m = 11{\cdot}7$ inches.

whether bound up or down channel, hat get embayed between Dodman point and the Rame head during a heavy southerly gale may run for it even with the loss of anchors; for having passed the eastern point of entrance and rounded Polruan point, they may safely run on the bar, which has in its deepest channel 7 to 9 feet water at the lowest tides, and being composed of soft mud, no harm can ensue. From this position vessels will be released by the flowing tide, and can run as far up as convenient.

There is space sufficient for four vessels of 16 feet draught and of moderate length to moor in Polruan pool, one quarter of a mile within the entrance; and although it appears on the chart to be exposed to south-west gales, it is not so, there being no swell between the entrance points.* Thirty vessels of 18 feet draught and moderate length may also lie moored above the bar quite land-locked. In 1879 there belonged to the port 160 sailing vessels, representing 17,458 tons. In the same year 2,080 vessels of an aggregate tonnage of 176,496 tons entered the port.

Life Boat.—A life boat is stationed at Fowey, which is also a coast-guard station.

Harbour Light.—A fixed *red* light is shown from the end of a private dwelling house situated about 180 yards westward of White House point, near the shore.

Tides.—It is high water, full and change, in Fowey harbour, at 5h. 14m.; springs rise 16¾ feet, and neaps 13½ feet. Equinoctial springs rise 18½ feet. The flood stream sets at the rate of three-quarters of a mile an hour at springs.

Directions.—Approaching Fowey from the westward, in order to clear the Cannis rock off Gribbin head, keep Dodman point on a W. by S. ¾ S. bearing, and showing south of the Gwineas rock, until the beacon on Gribbin head comes in line with the coastguard flagstaff, N. by W. ¼ W., or Fowey church tower is in line with St. Catherine point, N.E. ¾ E.; then bring the church tower in line with White House point, N.E. ¼ E., which mark will lead midway between the entrance points to an anchorage in Polruan pool.

Coming from the eastward, steer parallel with the shore, about the distance of one mile, until Fowey church tower is in line with White House point, when proceed as before. There is no danger off either point of entrance but what is visible, except Mundy rock, which lies one cable

* H.M. brig *Liberty* anchored in the entrance of Polruan pool in the month of July 1881; weather fine. In the afternoon of the same day a heavy swell arose with a S.W. wind, and compelled the vessel to run up the harbour.

within the entrance on the western side, and has 5 feet on it at the lowest tides.

In the roadstead outside the entrance there is good anchorage in from 5 to 8 fathoms, sandy bottom, with Fowey church showing over St. Saviour's point and the points, to the eastward open.

The Coast from Fowey trends in an E.S.E. direction nearly 4 miles to Nealand point, and between are Lantic and Lantivet bays, separated by Pencarro head, elevated 265 feet above high water; the cliffs vary from 50 to 300 feet in height, and the rocks uncover nearly one cable off shore. The Udder rock lies half a mile off the eastern shore of Lantivet bay, and uncovers 2 feet at the lowest tides. The northern extreme of Looe island in line with Orestone rock bearing East, or the coastguard flagstaff at Polperro in line with the cliffs bearing East, will lead half a mile south of Udder rock; and a vessel will be eastward or westward of it, when the beacon on the shore abreast the rock is east or west of Shag rock.

From Nealand point, which is remarkable from its overhanging cliff, the coast trends 1½ miles eastward to Downend point, and the rocks extend one cable off shore. One quarter of a mile off the latter point are Downend shoals, with 2 fathoms water over them; and thence the coast runs first to the north-east, and then bends to the south-east to Orestone point, forming Talland bay, which is one mile wide, and bordered by a number of rocky islets 30 to 60 feet high.

From Orestone point the shore trends N.N.E. nearly half a mile, with cliffs 30 to 60 feet high; and thence becoming much lower, runs nearly east, and, at low-water springs, is nearly connected with Looe island by flat shelving rocks. Looe island, half a mile in circumference and elevated 145 feet above high water, has off its south-east extreme the Rennies rocks, which extend upwards of one quarter of a mile in that direction from the point, and cover at a quarter flood.

Larrick Rock lies West 1½ cables from Nealand point, and covers at last quarter flood. The Shag rock kept open of Lyson point, N.W. will lead south of the Larrick; so will also the Black Bottle rock open of Pencarro head N.W. by W. ¾ W.

POLPERRO HARBOUR.—At one mile eastward of Nealand point is the mouth of a little inlet 160 feet wide, and at its head is the tidal harbour of Polperro, in which the mackerel and pilchard fishery is carried on to some extent. The harbour, formed by an outer and inner pier, is 3 acres in extent, and the tide rises 11 feet at springs, and 5 feet at neaps; the entrance between the outer pier head and the shore is 54 feet wide.

seaward, but vessels should not approach within the depth of 6 or 7 fathoms at low tide.

Coasters will find good anchorage with off shore winds in the bight in the south-east corner of this bay, in 3½ to 4 fathoms, sandy bottom, with the two western points of the promontory of Rame head in one, S.S.W. ½ W. At the distance of one cable from the northern of these points, and lying with the coast-guard house in the bight touching the high-water mark of the point, is a detached rock named the Pader, which covers at a quarter flood. There are also detached rocks, awash at low-water springs, lying the same distance off the southern of these points.

Tides.—It is high water, full and change, at Dodman point, and off the entrance of Mevagissey, Charlestown, Pentuan, Par, Polkerris, and Polperro harbours, at about 5h. 4m.; springs rise 15½ feet, neaps 12 feet.

EDDYSTONE ROCKS and LIGHT.—Eddystone rocks are awash at high-water ordinary springs. The north-west side is clear of danger; but the other sides are foul, particularly the north-east side, which should not be approached within a quarter of a mile. A small patch named N.E. rock lies E.N.E. 1½ cables from the lighthouse, and uncovers 2 feet at low-water springs; at half a cable to the N.N.E. the depth is only 3½ fathoms.*

The lighthouse on Eddystone rock is distant 38½ miles East from the Lizard; 8½ miles S.W. ½ S. from Penlee point; and 18 miles W. by N. ¼ N. from Bolt head. The tower is circular, built of granite, the lantern painted red; and exhibits from an elevation of 133 feet above the level of high water a *white double flashing half-minute* light, showing *two successive flashes* of about *two and a half seconds* duration, divided by an eclipse of about *four seconds*, the second flash being followed by an eclipse of about *twenty-one seconds*. The light is visible all round the horizon, and in clear weather should be seen from a distance of 17½ miles.†

A *fixed white* subsidiary light is shown from a window in the lighthouse 40 feet below the flashing light, to mark the Hand Deeps; it extends over a sector of 16°, from the bearing of S. 32° E. to S. 48° E.

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* *See* plan of Eddystone rocks; on Admiralty chart, Dodman point to Portland, No. 2620; scale, $m = 17 \cdot 2$ inches.

† Smeaton's lighthouse completed in the year 1759 was built on the north-west rock: this rock having in the year 1877 been found undermined by the action of the sea, it was determined to build a new lighthouse on a safer part of the rocks.

The new tower (built by Mr. Douglass, Engineer of the Trinity House) is situated about 100 feet S.S.E. of the old tower. The foundation stone was laid on the 19th August 1879, and the light was exhibited on the 18th May 1882.

The upper and larger part of the old tower has been removed for the purpose of being re-erected on the Hoe at Plymouth; the stump 27 feet above high-water, which remains, is painted black.

During thick and foggy weather, a large bell will be sounded *twice* in quick succession *every half-minute*—thus assimilating the character of the Sound signal to that of the light.

[NOTE.—Mariners will observe that the Casquets light, 78 miles S.E. ¼ E. from the Eddystone, is similar in character to the Eddystone light, but shows *three flashes* in quick succession instead of *two*.]

HAND DEEPS is the name given to a bed of sunken rocks lying N.W. ½ N. 3⅓ miles from the Eddystone lighthouse, and nearly in the track of vessels bound from the westward for Plymouth. They are composed of rocky pinnacles, on the highest of which are 4 fathoms at low-water springs, and therefore should be carefully avoided by vessels of large draught in a high sea or long swell. In bad weather the position of the shoal is shown by a short breaking sea in its vicinity, and in fine weather, by tide ripplings.

Marks.—From the centre of the Hand Deeps, the white signal-house on the high land in the rear of Rame head is seen westward of the building on the head, N.E. by E.; Earl Morley's park gate-way is wholly in view eastward of the high land of Penlee, or mount Batten round tower is in line with Penlee point; and the eastern part of the Moor hills is in line with the sharp top of the Mewstone, E. by N.

The lighthouse on Plymouth breakwater in line with Penlee point, E.N.E., leads upwards of one mile north-westward of the rocks; and the lighthouse in line with mount Batten tower, N.E. by E., leads the same distance to the south-eastward.

EAST RUTTS is the name given to a cluster of rocks, 2 cables long in a north-west direction and one cable wide, with only 5 fathoms water, and 10 to 19 fathoms close around. They are 4½ miles from the nearest land (Bolt tail), and in the fairway of vessels bound to Plymouth from the eastward.

Marks.—These rocks lie with the first rise in the land within Prawl point seen half way down the Bolt head bearing S.E. by E. ½ E.; Bigbury church spire over the right extreme of the sandy beach in Challaboro cove, N.E. by E. ½ E.; the Mewstone N.N.W. 7 miles; Bolt head S.E. by E. ½ E., nearly the same distance; and the Eddystone W. ¾ N. 11¼ miles.

The peak of the Mewstone in line with Maker tower N.N.W. ¾ W. leads nearly one mile eastward of the rocks; and the same peak in one with Stoke block-house and the fall of the land at Reny and Staddon points, leads 2 miles westward.

PLYMOUTH SOUND.—From Rame head, the Mewstone bears S.E. by E. ¾ E., 4¼ miles, and between them is the entrance to Plymouth sound, which is protected from south-west gales by a magnificent break-

water thrown across the entrance. Rame head, 335 feet high, with a small building on its summit, is the extremity of the promontory which constitutes the western boundary of the sound, and when viewed from the southward assumes a conical form. A quarter of a mile northward of the building, and near the coast-guard flagstaff, is a whitewashed house.*

The land in the neighbourhood of the Sound is easily recognised by many conspicuous objects, including the turreted beacon-tower on Penlee heights,† 351 feet high; the spire-steeple of Rame church; the high wall of the Rifle butt on Staddon heights; the breakwater and its lighthouse; the large towns and forts built round the sound, as well as the Great and Little Mewstones.

Plymouth and the adjoining towns of Stonehouse and Devonport, with their large suburbs, are built at the head of the sound, and together form one of the most flourishing places in the west of England. In 1881 the population of Plymouth amounted to 68,080, Devonport to 50,094, and Stonehouse to 14,586. In 1879 there belonged to the port 361 sailing vessels, representing 36,817 tons, and 15 small steam-vessels. In the same year 3,625 vessels of an aggregate tonnage of 713,382 entered the port. There are sugar refineries, also soap, starch, and lead factories, with several paper mills, in the neighbourhood. The rivers and railroads from Plymouth communicate with an extensive mining district.

Pilots.—There are 32 Trinity House pilots belonging to the port, and their limits are from the Start to Looe. The Queen's harbour-master's cutter, having a Government pilot to direct men-of-war where to anchor, is generally secured to a buoy moored inside the western arm of the breakwater.

The Mewstones, two in number, are generally known as Great and Little. The Great Mewstone is a precipitous rocky islet, with scanty vegetation and a sharp apex, 194 feet high and $1\frac{1}{2}$ cables in length, lying about half a mile S.S.W. of Wembury point, but the passage is so filled with rocky ledges, as to leave only a narrow channel available for boats. The Little Mewstone, 48 feet high, is a dark rock, about 100 yards to the south-westward of the Great Mewstone, and both objects form admirable landmarks.

Anchorage.—Cawsand bay, on the west shore of the Sound, affords good anchorage to vessels bound down channel and detained by westerly winds, being sheltered from S.W. $\frac{3}{4}$ W., round by west and north to S.E. by E. $\frac{1}{2}$ E. They should anchor south of the line of the central

* *See* Admiralty plan, Plymouth sound and Hamoaze, No. 30; scale, $m = 6$ inches.

† A flagstaff is erected on Penlee point just above the grotto, from which mail steam vessels are signalled.

division of the breakwater: to the northward of this the ground is rocky. If of large draught, keep Drake's island open of Redding point, and anchor abreast the village of Cawsand, in 5 to 7 fathoms, over fine sand, mud, and small shells. Smaller vessels will find the soundings regular, with sandy bottom as they approach the shore.

The best anchorage in Plymouth sound is comprised within the triangle formed by the following intersections; Penlee point in line with the west end of the breakwater; the centre of Cawsand in line with the west end of the breakwater; and St. John's church, Plymouth, in line with the west extreme of mount Batten. In this space there are from $5\frac{1}{4}$ to 7 fathoms at low-water springs, over soft mud, the latter depth being near the west end of the breakwater. By Admiralty regulations Her Majesty's ships are required to occupy the anchorage ground within and near the breakwater; and merchant vessels are to anchor in the north-east part of the sound. This latter anchorage is limited to the southward, by the two whitewashed marks on Rams Cliff point in line, bearing E.S.E.; and to the westward by the Hoe obelisk, and east end of Windsor terrace in line, N. by E. $\frac{1}{4}$ E.; or in line with the opening between Windsor Terrace and Hoe Park Terrace.

Small vessels may anchor on the flat north of Drake's island, in from 3 to 8 fathoms, over mud, sand, and gravel; but to the westward of a line joining the Asia and Melampus buoys, and about half a cable to the southward of the buoys used by H.M. training brigs, on the north side of Drake's island.

Torpedo Ground.—For the purpose of indicating the limits within which torpedo practice is made in Cawsand bay, four buoys, painted green and white in horizontal bands and marked *Torpedo*, are occasionally moored, namely:—No. 1. Moored in a line with, and half way between Redding point and Queen's grounds buoy. No. 2. Moored 750 yards west of Queen's Grounds buoy, in the direction of the Coast Guard station, Cawsand. No. 3. Moored 750 yards west of the second buoy, 1,500 yards from Queen's Grounds buoy, and S.S.W. from New rock. No. 4. Moored north of third buoy, and halfway between it and the shore.

As these buoys are westward of the fairway of the western channel of Plymouth sound, mariners are warned not to pass within the space marked by them. Fishermen will incur danger to their nets and boats by anchoring between the said buoys and the shore. The buoys are removed when the season for practice is over.

Mooring Buoys, &c.—Four trunk mooring buoys, to which large ships can shackle their cables, are placed in the southern part of Plymouth sound at $1\frac{1}{2}$ cables from each other. Ships can be swung for ascertaining the deviation of their compasses at either of these buoys. There is also a

's ships.

water forms the entrance to the river Plym, and is a
d harbour 190 acres in area, with a general depth of from
; there is a narrow channel of 3½ fathoms leading to a dee
ıe Turnchapel rock, where moorings are laid down, and 14
ır in tiers at low water. For the use of these moorings by me
a charge is now made. There are three building yards, two
nd a dry dock on its shores; the latter is 250 feet long, 5
entrance, 13½ feet over sill at high-water springs, and 9½ f

ht.—A white light occulting at intervals of five seconds is exh
ıe extremity of the breakwater which extends from the west
Batten a distance of 900 feet in a W. by N. ½ N. direction to
uoy. The light is elevated about 24 feet above high water.

ton Pool, at one-third up from its entrance, is enclosed by
n the pier-heads the width is 80 feet, and the depth 22 fe
ıter springs. On the east pier-head is a self-registering tide-g
ı is a dial-plate, which shows at all times the actual dep
veen the pier-heads. Within the pier-heads there are not
et at low water, and the greater part, consisting of soft
ere are three building yards, two patent slips, and a dry do
of the pool; the latter is 144 feet long, 37 feet wide at entr
ır sills at high-water springs.

—A white gas light, visible at 6 miles, is exhibited 29
n (Sutton

east point of entrance, within which is a pontoon pier for the accommodation of steam vessels; it has an area of 35 acres, with from 2¼ to 14 fathoms in it at high-water springs, and 1¾ to 12½ fathoms at neap. On the western side of Mill bay is a pier alongside which vessels of 24 feet draught can lie afloat. The pier is 900 feet long, and near its outer end is a basin for Government boats.

Steam tugs, coals, water, and other supplies are immediately available, and there is direct communication between these docks, and the Great-western, South-western, and Cornwall railways. No vessel is allowed to enter or leave the Mill bay without first communicating with the dock-master.

Lights.—At Mill bay there is a *red* light on the pier head, and a *green* light on the pontoon; these lights in line will clear the Melampus shoal, passing westward of the Asia buoy. Two *green* lights placed vertically at the western end of Mill bay pier are shown when vessels may enter the tidal basin. Another red light is shown under the present red light when vessels are *not* to enter Mill bay.

Two fixed red lights placed horizontally are shown from the head of the western pier; and two white lights, vertical, mark the western end of the east jetty or Trinity pier at Mill bay.

Life Boat.—A life boat is stationed at Mill bay.

Stonehouse Pool lies between the towns of Stonehouse and Devonport, and at its entrance, off the victualling yards, there are from 5 to 20 fathoms at high water; a short distance farther up the muddy bottom dries at low tide. There are two building yards in this pool.

HAMOAZE is formed at the mouth of the river Tamar, between mount Edgecumbe and Albert bridge at Saltash, and its deep water space is fully taken up with moorings for Her Majesty's ships. Its entrance is somewhat contracted and circuitous, but it contains space sufficient for several first-class ships at moorings, independent of anchorage for small vessels, in moderate depth of water, good holding ground, and well sheltered from wind and sea. At the quays of Devonport, and in the rivers and creeks that have their outlet in Hamoaze, a considerable coasting trade is carried on for the supply of this populous neighbourhood, and for exporting the mining produce of the surrounding country.

Dock and Steam Yards.—Her Majesty's dockyard, gun wharf, and Keyham steam yard, are on the eastern shore of Hamoaze, their water frontage occupying an extent of about 7,000 feet. The dockyard has an area of 71½ acres, and from its south end it extends in a circular sweep to the northward as far as the gun wharf, which separates it from Keyham yard, with which, however, it is connected by a tunnel. A camber and

boat pond nearly divide it into two parts, in the northern of which, facing the harbour, are three dry docks, 263¼, 209½ and 415½, feet respectively in length on blocks, 64½, 56, and 73 feet wide between gates, and 21½, 21, and 32 feet over sill at high-water springs; a basin 300 feet long, 230 feet wide, and 31 feet over sill, and at its head is another dry dock 303 feet long on blocks, 65 feet wide between gates, and 28 feet over sill. There is also a graving slip 169 feet long, and 62 feet wide; and a new dock in course of construction.

In the southern part of the dockyard are three building slips, 253½ 266, and 323½ feet respectively in length on blocks, and 52, 52½, and 53½ feet in breadth; two slips for small vessels; an outer and inner mast pond, mast houses, &c., and the finest ropery in the kingdom.

The gunwharf is separated from the dockyard by a portion of the town named Cornwall street; it covers about 10 acres of land, and besides the depositories for gun carriages, and the implements of the field train, there are piles of ordnance and shot belonging to the ships in the harbour. Between it and Keyham yard is the Ferry road, connected with Torpoint by a steam bridge, and some private quays and canals occupying a water frontage of about 1,000 feet.

Keyham steam yard has an area of 73 acres exclusive of ground north of Keyham, and that part of mud flat filled up with surplus excavation from the dock and basin, and now appropriated as a timber park covering an area of 22 acres.

Keyham yard proper comprises two floating basins, one boat basin, and three dry docks; a covered area of about 7 acres for steam machinery, foundry, boiler-house, smithery, store-houses, and work-shops, as well as coal stores, work-sheds, two pumping engine and boiler-houses belonging to the shipwright department.

The basins and docks are constructed of Cornish granite backed with limestone, and around them are three large sheers, with machinery capable of lifting from 40 to 100 tons, besides 13 others with lifting powers varying from 5 to 40 tons. Hydraulic and steam capstans are provided round the basins and docks.

The south basin of 7 acres area has 29 feet in it at high-water springs, and can be pumped up to 32 feet. It is entered from Hamoaze by a lock 80 feet wide, with 33½ feet over sill of caisson at high-water springs. In its eastern part are three dry docks, the entrances of which, 80 feet wide, are closed by wrought-iron caissons.

The docks are 417, 295, and 347 feet in length respectively, on blocks from bilge of caisson. The North or Queen's dock has 27 feet over sill, and can be pumped up to 3 feet more. The middle dock 23 feet, and South dock 26 feet over sill, with the addition of 4 feet rise by new

pumping power. The entrance lock is 253 feet long, 80 feet broad, and 34 deep on sill at high-water springs.

The North basin, over 9 acres in area, has 34 feet water at high-water springs, and this depth can be increased 3 feet. It has two entrances, 80 feet wide, from the Hamoaze; the one from the north with a depth of 32 feet over sill at high-water springs, and the other from the south with a depth of 25 feet over sill, can be raised to 28 feet if necessary. Each entrance is closed by caissons raised and sunk by air chambers and water ballast.

A boat basin, 300 feet long, and 92 feet average width, has been completed at north-west end of yard, with an entrance from Hamoaze 30 feet wide, and approachable at all times of tide.

A branch Railway line, three-fourths of a mile long, connects the Cornwall railway with Keyham yard, and thus communication with the railway system and other naval Government establishments is effected.

The Royal William victualling yard, 17 acres in area, occupies a tongue of land on the eastern side of the entrance of the harbour, and consists of a quadrangular pile of buildings and spacious quays, fronted by a sea wall about 1,600 feet in length. In the middle of the wall facing Stonehouse pool is the entrance to a basin, about an acre in area, and closed by a boom. On the summit of an adjoining eminence is a stone reservoir supplied from the Plymouth leat, and calculated to contain 6,000 tons.

BREAKWATER.—This magnificent structure for the protection of the Sound was commenced in 1812. Its western extremity is distant about 2 cables to the northward of the shoal of the Panther; and thence it extends towards Bovisand bay, directly across the shoal of the Shovel, and its eastern end terminates in the vicinity of Staddon point, from which it is distant about $3\frac{1}{2}$ cables. The central division of the breakwater is 1,000 yards long, N. 86° W., and S. 86° E. (true); and from each end an arm projects 350 yards, at an angle of 14° to the northward of the central division, thus shutting in that part of the Sound which lies south-eastward of a line between Penlee and Dunstone points.

The breakwater is constructed of granite and limestone, brought from the quarries at Oreston, on the east shore of Catwater. The body of the work is of rubble masonry; but from low-water line, on each side, to the top, the surface stones are dressed and laid in Roman cement, and have on the outer face a slope of one to 5, and on the inner face a slope of one to 2. Below low-water line the slope has been formed by the action of the waves, and the general average is that of one to 2. A stone lighthouse, 76 feet high, is erected on its western end, and on its eastern end is a conical beacon, bearing a mast with a skeleton ball on its summit. The mast has steps, and the ball is fitted to receive within it six men, in

case of shipwreck. Six stone shelters are built on the east end of the breakwater.

LIGHTS.—The lighthouse on the western end of the breakwater exhibits from an elevation of 63 feet above high water an occulting light, whereby once in *every half minute*, it suddenly disappears for *three seconds*, and as suddenly reappears at full power; the light shows *white* seaward between the bearings of W. by N. ¼ N. and S.W. ¼ W.—or in the direction of Staddon point, thence round by the south and west through Cawsand bay and up the Sound to the direction of the Melampus buoy,—but it shows *red* as soon as it bears S.W. ¼ W., and over all the anchorage ground within the breakwater; and no vessel should anchor till the light changes from white to *red*. The light is visible in clear weather from a distance of 9 miles.

In foggy weather a bell is sounded *four times a minute*.

A *fixed* white light is also shown in the breakwater lighthouse, 15 feet below the occulting light, to serve as a leading light to guide vessels by night in entering Plymouth Sound by the western channel. It will become visible immediately upon passing the chequered buoy of the Draystone from the westward, and the black buoy of the Knap from the eastward, and is so placed that it can be seen only between the bearings of N.E. by E. ¼ E. and N.E. ¼ E., or over an arc of 12°. When the fixed white light is seen the channel is open, and vessels may run direct for the light, giving it a berth of about one cable in rounding the breakwater.

Breakwater Fort.—Inside the breakwater, off the middle of the central arm, a fort is erected, elliptical in form, with its major axis, 150 feet long, parallel to the line of the breakwater, and distant from the nearest part of the landing-place pier 79 yards; the depth of water between is 4¼ fathoms.

Time Signal.—Greenwich mean time is daily shown at 1 o'clock p.m. by the instantaneous collapse of a cone suspended near the top of the flagstaff in the redoubt on mount Wise, Devonport. When not in use, the cone hangs in a closed state on the flagstaff.

As a preparatory notice, the cone is extended to its perfect shape, at 8 minutes before 1 o'clock, and at the instant of 1h. p.m. of Greenwich mean time it collapses. Again, at 2 minutes later it is once more extended, and at the instant of 1h. 5m. p.m. it again collapses. The second collapse is made in order to verify the first, or in the event of its not having been noted by the observer. The time signal is not made on Sundays.

The cone is of canvas 4½ feet in diameter, and painted black. It is suspended below the flag on the flagstaff, at an elevation of 167 feet above the level of high water. Its collapse may be seen in clear weather with

a glass at a considerable distance outside the Breakwater when bearing between N. by W. and N. by E.

Mount Wise may be known by its southern green slope; also from its proximity to St. Stephen's church, which has a remarkably sharp spire. The position of the flagstaff on the mount is lat. 50° 22′ N., long. 4° 10′ 15″, or 16m. 41s. West of Greenwich.

Storm signals are shown at mount Batten, Mill bay, mount Wise, and the dockyard.

DANGERS OUTSIDE THE BREAKWATER.

The dangers at the entrance of Plymouth Sound, outside the breakwater, are: on the western side, the Draystone; in the centre the Knap, Panther, Tinker, and for large ships, some patches of rocky ground lying off the east end of the breakwater; and on the eastern side, the reef off the Mewstone, with the Shagstone, and the rocks in its vicinity.

Draystone Reef, projecting nearly one quarter of a mile in a south-easterly direction from Penlee point, is marked by a chequered red and white buoy moored in 5 fathoms on its outer extremity, with Rame head coast-guard mast on with the north side of a remarkable gap in the cliff in Lillery cove, N.W. by W. ¾ W.; the west side of the third fish store from the northward in Cawsand bay, in line with Penlee high-water point, N. ¾ E.; and west end of the Queen's Harbour Master's house at Long room hill, Mill bay, in line with high-water mark of Redding point.

Should the buoy be adrift, do not stand nearer the reef than to bring the tall sharp spire of Roman Catholic church, open of Redding point N.E. ½ N.; this leads eastward of the Draystone, over which, at low water, there is only a depth of 11 feet, though between it and the point the water deepens to 19 feet.

Knap and Panther Shoals constitute nearly one continued shoal of sand and rock, having only 20 and 22 feet at low water over their shoalest heads, with casts of 5 to 7 fathoms between. The two shoals combined are upwards of one-third of a mile in length S.W. by W., and from the outer and shoalest spot on the Knap, with 20 feet water, the Breakwater lighthouse is distant half a mile N.E. The passage between the lighthouse and the inner end of the Panther, with 22 feet, is 2 cables broad, with from 6 to 9 fathoms water, and may occasionally be useful. The leading mark through is, the Shagstone in line with northern high-water point of Mewstone S.E. by S.; the same mark will also lead north of the Tinker, in not less than 4 fathoms.

The inner and outer end of this compound shoal is marked by a black buoy. The Panther buoy, on the north end of the shoal, lies in 7 fathoms,

with mount Wise flag-staff in line with west extreme of the Breakwater platform, N. ¼ E. ; the Breakwater beacon midway between Bovisand house and Bovisand cottages, E. by S. ; and the Shagstone its own breadth open northward of the Mewstone, S.E. by S.

The Knap buoy, on the south end of the shoal, lies in 6 fathoms, with the blockhouse on Devils point just open eastward of Ravenness point, N. by E. ½ E. ; and the Breakwater beacon in line with the south end of Bovisand coast-guard houses, E. ¼ N.

Tinker Shoal.—The centre of this shoal lies about three-quarters of a mile S.W. by S. from the east end of the breakwater, is one quarter of a mile in length, east and west, one-eighth of a mile in breadth, and has from 15 to 20 feet water.

Each end of this shoal is marked by a white buoy. The western buoy is placed at the north-west angle of the shoal, in 6 fathoms, with the dock-yard chapel in line with Ravenness point, N. ½ W. ; the Breakwater beacon on with the east end of Catdown quarry cliff, N.E. ¾ N. ; and the highest peak of Reny rock in line with the right extreme of a small dark quarry on Wembury point, S.E. by E. ¼ E.

The eastern buoy lies at the south-east angle of the shoal in 5 fathoms, with the Breakwater lighthouse in line with the east turret of Picklecombe fort, N.N.W. ; the house in Staddon high north battery in line with the inner part of curve of Bovisand pier head, N.E. ½ N. (there is a white-washed mark on the pierhead) ; and the highest part of Reny rock in line with the centre of Wembury point quarry, a small dark pit, S.E. by E. ¼ E.

Rocky Patches.—Between the Tinker shoal and the east end of the breakwater are several rocky 4-fathom patches, two of which, near the centre of the eastern channel, are marked by black and white chequered buoys, sometimes termed the fairway buoys. The outer or southern buoy, near which is 26 feet water, lies with the Shagstone in line with the peak of the Little Mewstone, S.S.E., and the Breakwater beacon in line with the citadel flagstaff, N. by E. ½ E. The inner buoy has 25 feet near it, and lies with the Breakwater beacon in line with the citadel flagstaff, N. by E. ½ E., and the Breakwater lighthouse in line with the gamekeeper's cottage, mount Edgecumbe, N.W. ¼ N.

Mewstone Ledge runs out 1½ cables in a south-westerly direction from the peak of the Little Mewstone, and its extremity is marked by a red buoy moored in 9 fathoms at low water, with the peaks of the Great and Little Mewstones in line, N.E. by E. ½ E.; and north-west corner of Great Mewstone in line with top of roadway on Wembury point; Devon-port monument and the Shagstone in line.

The Shagstone in line with the Breakwater beacon, bearing N. ¼ W., leads nearly 2 cables westward of the reef.

The Shagstone is a small square-headed rock, about 4 feet above high water, lying one mile N.N.W. ¾ W. from peak of Mewstone, and one-sixth of a mile from a rocky islet named the Reny, there being between the two a reef of detached rocks dry at low tide. The Shagstone marks the outer edge of a rocky ledge, which fronts the shore between the Mewstone and Bovisand bay, and forms during the day an admirable mark.

To the northward of the Shagstone, as far as Andern point, this ledge extends half a mile off shore, and its outer edge is marked by two red buoys, the southernmost of which is moored in 4¼ fathoms, with the Shagstone in line with the peak of the Mewstone S.S.E. ¾ E., and the Breakwater beacon in line with east end of Hoe quarry, N. ¾ E. The northern buoy is placed in 5½ fathoms, with the small building on Rame head in line with first hollow in cliff north of Penlee point, W. ¾ N.; and the Breakwater beacon in line with boundary wall of West Hoe quarry, N. ¾ E. easterly.

DANGERS WITHIN THE BREAKWATER.

Within the Breakwater are the Duke rock, and Leek bed on the eastern side of the Sound; the Queen's grounds and other shoals near Redding point on the western side; the Bridge, extending from Redding point to Drake's island; the Dunstone shoal near Dunstone point; the Melampus, a ledge extending from the south-east angle of Drake's island; the Asia, Winter, Mallard, and Cobbler shoals, between Drake's island and mount Batten; the flat on north side of Drake's island; the Vanguard and German rocks on south side of Devils point; the Cremill shoal, extending from Cremill point; and the Rubble or Harbour shoal, running off from the south-west angle of the dockyard.

Duke Rock lies near the west end of a bank extending in a convex form between Staddon and Rams cliff points. Near the outer edge of the rock a white buoy is moored in 5 fathoms about one-third of a mile N.N.E. ¼ E. from the Breakwater beacon, and nearly the same distance from Bovisand pier head; it also lies with the eastern high chimney in the Victualling-yard, in line with the west high-water extreme of the islet lying off the north end of Drake's island, N. by W. ½ W.; the obelisk on the Hoe in line with Diamond mark, N. by E.; and south end of Bovisand cottages in line with tangent of circular fort at Bovisand, S.E. ¼ E.; and the grotto in line with south corner of Iron fort.

The least water over the rock, 18 feet, lies half a cable south-eastward of the buoy, and there are 4 and 5 fathoms between the shoalest heads.

Queen's Grounds consist of several patches of rock, with from 3¼ to 4 fathoms water, nearly midway between Picklecombe point and the Breakwater lighthouse. A red buoy is placed in 5 fathoms on their south-eastern extremity, with Devils point block-house in line with Redding point, N. by E. ½ E., and the peak of the Mewstone in line with the Breakwater west crane, S.S.E. ¾ E. On the west side of the Sound the ground is generally hard and rocky, and unfit for anchorage.

New Grounds.—The depth on the shoalest part of this rocky shoal has been increased by the diving bell to 29 feet; a red buoy is moored on the shoal with the tower of Railway hotel, Plymouth, in line with the lower wall on the east end of Drake's island, N.N.E. ¼ E.; west end of east building shed (dockyard) in line with Wilderness point, N. by W. ¼ W.; north end of Bovisand cottages (in ruins) touching south side of Bovisand fort, S.W. ½ W.

The Bridge is a rocky reef or submarine causeway connecting Drake's island with Redding point. The deepest channel over it has 7 feet at low-water springs, and is indicated by two beacon buoys, the inner one white and the outer one red; vessels may pass them on either side, but very closely, as the channel leading midway between two rocks which have 4 feet water is only 60 yards wide in its narrowest part. At night a red gas light at the landing, mount Wise, just open or shut by Devil's point leads over the Bridge.

During bad weather, especially with a southerly wind and an ebb tide, the sea breaks heavily across the whole of this channel, and no boat or small craft should then attempt it after ebb tide. The leading mark through is St. John's chapel, Devonport, in line with the tower on Devils point N. ¾ W.* The cross mark for the shoalest part of the Bridge in the channel, is the south-eastern extreme of the rampart of Drake's island in line with the south-east angle of the citadel.

Dunstone Rock lies W. ¼ S. 2 cables from Dunstone point, on the east side of the Sound; and from its shoalest head, with 19 feet water, Charles church, Plymouth, is in line with the west side of Fishers Nose, N. by E.; and the obelisk on mount Edgecumbe is in line with the north extreme of fort on Drake's island, N.W. by W. There are 4 fathoms water within and around the rock.

Melampus Shoal is the south-eastern extreme of the rocky ledges extending from Drake's island. It is marked by a black buoy, from which St. Andrew's church tower, Plymouth, is touching the west side of the

* A coast guard boathouse has been built at Devil's point, which makes the tower difficult to distinguish.

obelisk on the Hoe, N.N.E. ¾ E.; St. John's chapel turret, on with Victualling yard gate ball; and Bakery chimney (eastern) in Victualling yard, over north-east cliff of Drake's island. A tall chimney, recently erected in Catdown quarry, in line with mount Batten tower leads just south of Melampus shoal.

Asia Shoal, at the north-eastern extremity of the ledges extending from Drake's island, is marked by a white buoy which lies in 5 fathoms, with the N.W. and N.E. buoys of the Winter in line with mount Batten coast-guard flagstaff, E.S.E.; the Camera on the Hoe in line with the south-east angle of Esplanade terrace, N.E. ¼ N.; and Ravenness ruin in line with the south-east extreme of the islet off north-west end of Drake's island, W. by S.

Winter Shoal, with 10 feet water, lies nearly midway between Drake's island and Fisher's Nose. Between it and the island there are not more than 4¼ fathoms at low water, but eastward of the shoal there are from 10 to 18 fathoms; it may therefore be considered as a rocky knoll rising from the ledge on which the island stands. Within the 3-fathom line of soundings the shoal is nearly square, and about 120 yards across; it is marked by three buoys, viz., one on its north-west edge, another on its north-east, and the third on its southern edge.

N.W. buoy, striped red and white, lies in 4 fathoms, with Gills soap-factory chimney in line with north-east angle of West Hoe terrace, N. by W.; Bank's house (yellow) in Queen Anne ship-yard in line with east angle of Citadel, E. by N. ½ N.; and Ravenness ruin in line with south end of barracks on Drake's island, W. ½ S.

N.E. buoy, chequered red and white, lies in 5 fathoms, with Plymouth Guildhall spire in line with west angle of diamond mark; south end of Buenos Ayre trees half the breadth of house open north of coast-guard houses.

South buoy, red, lies in 3 fathoms, with the north end of Cawsand coast-guard houses touching Redding point, W. by S. ½ S.; the chimney of Gills soap factory in a line with the east end of West Hoe terrace, N. by W.; and the obelisk at Cremil point in line with the end of the grass on Bottlenose point, N.W. by W. ¾ W.

Mallard Shoal lies south of the citadel, and directly in the fairway to Catwater; the least water over it is 12 feet, and there are 5 and 6 fathoms on all sides. Its north-west extreme is marked by a black buoy, lying in 7 fathoms, with Cawsand coast-guard houses just in sight over Redding point, W. by S. ¾ S.; and the obelisk on mount Edgcumbe in line with second embrasure of Western King fort, W. by N. ¾ N.

Cobbler Shoal is the west extreme of the rocky ledge extending from mount Batten, and its outer end is marked by a black buoy moored

water. The southern turret of mount Edgcumbe house in li
itewashed mark on the rocks in Barn pool, also leads to the
of the flat. A black can buoy marks the north-west spit
s, and from it Cremil obelisk is on with Wilderness point, a
d of Esplanade terrace is over the middle of West Hoe terrac

anguard and German Rocks are the highest hea
rocky patches lying South from Devils point. The German
feet water, lies 146 yards from the blockhouse on the poin
ly be in the way of small vessels. Staddon barn in line with
south side of Drake's island, S.E. ¼ E., leads outside the G
nd between it and the Vanguard.

Vanguard, with 3 fathoms over it, lies fully one-third acros
l, and is much in the way of large ships going to and
ze; its south side is marked by a black mooring buoy, plac
oms. From the shoalest head, of 3 fathoms, mount Wise fla
ne with the centre of tower on Devil's point, N. by W. ¼ W.
ling office clock vane is on with west end of Western King
E. ¼ E.; and the Camera mast on the Hoe is on with south-
West Hoe terrace, E. by N.

mill Shoal is a spit running off from Cremill point, an
st extreme is marked by a black conical buoy. The Breaky
se, open of Ravenness point, S. ¼ W., until Southdown
opens of Cremill point, bearing W. ¼ S., clears the shoal o
ide.

ble Bank or Harbour shoal [illegible]

For clearing the extensive mud flats that fringe the rivers which discharge themselves into the Sound, it is better to trust to the knowledge of local pilots and the chart, than to attempt diffuse descriptions.

TIDES.—It is high water, full and change, at Devonport dockyard, at 5h. 43m.; springs rise 15½ feet, neaps 11½ feet. The range of tide is greatly influenced by the wind; southerly gales raise the water from 2 to 3 feet above its ordinary level, whilst strong northerly winds cause a corresponding depression. At the Breakwater it is high water about a quarter of an hour earlier than at the dockyard.

The tides are tolerably regular in Plymouth sound, running each way about six hours, and following the trend of the shores; on an average the turn of the stream takes place half an hour after high and low water on the shore. The greatest velocity at the entrance, and in the Sound, is about 1½ knots; and in the harbour, 2½ knots.

The flood runs up fair between Asia and Winter shoals, tending rather to set over the former. From Vanguard rock it sets towards Barn pool, and thence turns towards the fair channel and runs for mount Wise; after which it takes the fair course of the harbour. When leaving Hamoaze on the flood, take care to guard against the tide which sets strong from Vanguard rock towards Barn pool, for in the attempt to round that rock vessels are often caught by the flood on their port bow, and although they meet it with starboard helm, are frequently set into Barn pool, even into the eddy.

The ebb, from off the dockyard, sets directly from the Rubble bank towards Millbrook lake, so that vessels in going out of Hamoaze on the ebb, must be careful that they are not set over on the flag-ship before they can recover their course. From Mutton cove it runs towards Devils point and sets with great strength over Vanguard rock. The eddies within the Vanguard and off Devils point are very strong.

WESTERN CHANNEL.—Directions.—One remarkable feature in the soundings on approaching Plymouth Sound is, that a depth of 20 fathoms at low water extends along parallel with the shore, passing three-quarters of a mile outside Rame head, the Mewstone, and Stoke point, and 2¼ miles outside the Breakwater, which will greatly assist in showing the vessel's position in thick or foggy weather.

There are two entrances into the Sound, one, the Western channel, between the red buoy of the Queen's grounds and the western end of the breakwater, and the other, the Eastern channel, between the eastern end of the breakwater and Staddon point. The former is nearly half a mile wide, and carries from 6 to 9 fathoms at low water; but the 5-fathom

channel of the latter is narrowed in some places to the breadth of 80 yards.

The Western channel is the only entrance that can with safety be used by large ships at all times of tide. When bound through it from the westward, after passing Rame head, keep a good quarter of a mile off shore, and do not attempt to round Penlee point until mount Batten tower is in line with the Breakwater lighthouse, N.E. by E.; this mark will clear the Draystone, and lead up towards the western end of the breakwater, to which give a berth of one cable in rounding, and then haul to the northeast for the anchorage.

In working through the Western channel, when standing towards the Draystone, do not open mount Batten tower westward of the Breakwater lighthouse. When the vessel is northward of the line of Stoke point on with north high-water point of Mewstone, S.E. ¼ E., in standing towards the Knap and Panther, do not open the tower to the eastward of the lighthouse. When standing towards Queen's grounds avoid shutting in the east end of Esplanade terrace with the east end of Drake's island. In working along the south side of Drake's island, keep the whole of Cawsand open of Redding point.

Cawsand bay may be ranged by the lead alone, but keep outside the buoys marking the torpedo ground (*see* page 83). In working through, however, if the ship is of large draught, do not approach within a quarter of a mile of its southern shore, nor stand farther westward than to bring the west end of Drake's island touching Redding point; the latter mark, however, will lead within the torpedo ground, therefore tack short of the buoys (striped green and white in horizontal bands). Having passed the line of the breakwater, or the lighthouse and beacon in one, keep a good half mile off shore.

Vessels from the eastward intending to enter the Sound by the western channel, and being about half a mile outside the Little Mewstone, with the Breakwater beacon and Shagstone in line—which is the clearing mark for Mewstone ledge—should steer so as to pass outside Knap shoal, the fore clearing mark for which is Maker church in line with Gamekeeper's cottage N. ¾ W.; and the back mark, the north high-water line of Great Mewstone in line with Stoke point S.E. ¼ E. After passing the Knap proceed as above directed.*

At Night bring the Eddystone light to bear S.W., and keeping it in that direction astern, run in until the upper light (*white occulting*) in the Breakwater lighthouse is seen, which will be right ahead if the bearing of the Eddystone has been preserved. Having made this light, steer for it

* Vessels should not attempt to work in with an ebb tide.—Staff Captain D. Moore, .N., Queen's Harbour Master, 1882.

on a N.E. by E. bearing until the lower *white leading* light in the light-house is seen, when the channel will be open, and keeping the leading light in sight, run direct for it. After rounding the breakwater about a cable distant, haul to the north-eastward, but do not anchor till the light has fully changed to *red*, which it will do, when it bears S.W. ¼ W. Bear in mind that the last of the ebb sets strongly towards the breakwater.

EASTERN CHANNEL.—Directions.—The Eastern channel into the Sound should not be attempted at night, nor at any time by vessels of large draught, unless with a free wind, or with steam, because of the numerous rocks which are scattered in its vicinity, and the occasional scend or depression of the sea there with south-westerly and south-easterly winds. The channel is marked by buoys, the passage between which, as already remarked, is in some places very narrow, but free from danger.

The obelisk (painted with white and red horizontal bands) on the Hoe, kept exactly in line with the Breakwater beacon, N. by E. ¼ E., leads through between the Tinker and Shagstone, and between the shoals on either hand direct to the east end of the breakwater, in not less than 5 fathoms at low water. After rounding the breakwater at the distance of one cable from the beacon, steer to the north-west for the anchorage, taking care to avoid Duke rock.

There is a channel frequently used by vessels between the east end of the breakwater, and the shoal patches of the Eastern channel. It is about three-quarters of a cable wide, and not less than 5 fathoms will be found in it at low water by keeping the east corner of the lower and new fort at Bovisand in line with the centre of the south-west facing of Brown hill battery, bearing E. by N. This channel is also useful to vessels bound westward with scant westerly winds, when, owing sometimes to the crowded state of the Sound, they have not room to make their boards to the westward.

When running into or out of the Sound in the daytime upon any of the before-mentioned leading marks, bear in mind that so long as Bolt head is in sight south of the Mewstone, the vessel will be without or southward of all the shoals; and that Bolt head shut in with the Mewstone, ranges closely upon the tails of both the Tinker and Knap. When entering the Sound from the eastward, do not approach the Mewstone nearer than half a mile, till the Breakwater beacon is in line with the Shagstone bearing N. ¼ W., which mark will lead 2 cables westward of the Mewstone ledge in 11 fathoms water.

DIRECTIONS for HAMOAZE.—Two channels lead into Hamoaze, one carrying 12 to 15 fathoms between the Winter and Mallard

shoals, the oth[illegible] 1½ fathoms between the Winter and Asia. Gill's soap factory chimney [illegible] from end [illegible] West Hoe terrace marks the limits of the channel between the Win[illegible] and Asia, and this passage is generally taken by large vessels, except at low-water springs; for although the other is d[illegible] the turning is sharp, and there is a difficulty in winding a long ship.

The wind [illegible] S. by W., round [illegible] to East, will enable a vessel to lie through [illegible] and from West, round by north, to N. [illegible] from Hamoaze to the Sound without a tack, [illegible] that near half flood the stream runs with [illegible] Cremill point and Devils point, so that [illegible] a steam-vessel [illegible] is necessary, and it is therefore [illegible] the strength of the tide.

When passing through [illegible] the above channels from the anchorage [illegible] Sound, steer [illegible] the [illegible]-eastward to bring the obelisk on the Hoe [illegible] with the [illegible] mark on a high-water rock below the Hoe [illegible] N. by E. [illegible] between the Winter and Madam [illegible] channel between the Winter and Asia [illegible] Gill's soap factory chimney in line w[illegible] N. ½ W.

Keep[illegible] obelisk is in line with the second [illegible] N. ½ N., which will lead through [illegible] the south-east angle of [illegible] the south-west angle of West [illegible] N. [illegible] Then haul to the south-west[illegible] between Drake's island and the [illegible] as nearly in [illegible] channel well open of [illegible] the [illegible] minimum [illegible] between Devils and [illegible]

[illegible] usually keep over [illegible] the front [illegible]

[illegible] bearing [illegible] the south [illegible] the north-[illegible] south-west

angle of Winter Villa S.E. by E. ½ E.; either of these marks will lead south of the Rubble, and when the tower of the Dockyard chapel opens north of the master-attendant's office, N.E. by E., either anchor or proceed farther up the harbour.

There are also two 4-fathom channels, one between the Mallard and Cobbler shoals, by keeping the spire of St. John's church, Plymouth, in line with Fisher's Nose, N.E.; and the other between Mallard shoal and the Citadel, by keeping Ravenness ruin on mount Edgecumbe between the two barracks on west end of Drake's island, W. ¾ S. This latter mark leads up to the following mark for the best water to Turnchapel docks, viz., St. Andrew's church tower, in line with the lamp on west pier head of Sutton pool.

The RIVER TAMAR rises near Moorwinstow, in the moors which form the north-east point of Cornwall, and after following a southerly course for about 60 miles, and forming the boundary between Devonshire and Cornwall, falls into the sea in Plymouth Sound. It has some small tributaries named the Deer, the Claw, the Werington, the Attery, the Lyd, and the Inny.*

Below its junction with the Inny, its course, hitherto tolerably straight, becomes more sinuous, especially when it skirts the base of Hingston down, after which the river gradually widens out. Near its mouth, on the left bank it receives the waters of the Tavy from Dartmoor forest, and on the right bank the Lyhner or St. German river from the downs between Launceston and Bodmin.

The river is tidal for the distance of 16 miles from its mouth to the Weir head, the entrance to the canal one quarter of a mile below which may be reached at high-water ordinary springs by vessels of 5 feet draught. This head or barrier is a solid wall of large blocks of stone held together by iron clamps, 15 feet wide on the top and 100 feet in length, and is partly dry when the river is in a very low state. It was built about 100 years ago for the purpose of establishing a salmon fishery and to keep up a head of water for the use of the adjoining canal, by which there is a barge communication with the reach above, that fronts the large and increasing village of Gunnislake.

On the right bank, at 4 miles below the Weir, is the village of Calstock, the inhabitants of which are chiefly employed at the mines and in the despatch of vessels. Here the river is navigable for vessels of 12 feet draught at high water, and for boats only at low-water springs. In the year 1861, 70,000 tons of shipping (chiefly schooners of 120 tons burthen) passed this place laden with coals and copper ore. Opposite the village is a convenient building yard, where barges and vessels of upwards of 100 tons

* *See* Admiralty chart, Tamar river, No. 882; scale $m = 6{\cdot}0$ inches.

burthen are well built and repaired. The river has 10 feet only in it during low water at its junction with the Tavy, which is tidal for 5 miles, or up to the falls, which may be reached at high-water springs by vessels drawing 5 feet. At Maristow quay, and a half mile lower down, vessels of 8 and 10 feet draught unload.

The town of Saltash stands on the ascent of a steep hill on the right bank of the Tamar, a little above its junction with the St. German. Here the river is crossed by the Royal Albert bridge, over which passes the Cornwall railway. This noble structure consists of 19 spans, 17 of which are small and lead from the hills on either side, but the two others resting on a cast-iron pier of four columns in the centre of the river, cross the whole stream, a distance of 910 feet. Its greatest length is 2,240 feet, its width at basement 30 feet, and the height of centre pier from foundation to summit 260 feet. The roadway is 100 feet above high-water springs, at which time of tide there are 11½ fathoms in the channel on the west side of the centre pier, and 9½ fathoms in that on the east side. Saltash also connected with the opposite shore by a steam bridge.

The tide flows up the St. German as far as Tideford, which is 6¾ miles from its junction with the Tamar, and may be reached at high water by vessels drawing 6 feet.

The town of Torpoint is 2 miles below Saltash, on the right bank of the river opposite Devonport, with which it is connected by a steam bridge.

Tides.—It is high water, full and change, at Saltash, in the river Tamar, at 5h. 45m., springs rise 15 feet, neaps 11 feet; Cargreen, at 5h. 47m., springs rise 14½, neaps 10¾ feet; at Pentillie at 5h. 55m., springs rise 13½, neaps 9½ feet; at Calstock at 6h. 6m., springs rise 12½, neaps 8½ feet; at Morwellham at 6h. 12m., springs rise 10½, neaps 6½ feet; and at the Weir head at 6h. 17m., springs rise 5¼, and neaps 1¼ feet. At Warleigh quay in the river Tavy at 5h. 47m., springs rise 14½, neaps 10½ feet; at Maristow at 5h. 47m., springs rise 8½, neaps 4½ feet.

WEMBURY BAY.—The coast from abreast the Mewstone trends to the south-east 1½ miles to Yealm head, forming a bight named Wembury bay, which receives the waters of the Yealm in its north-east corner. The outer or south point of Yealm head is low at its extreme, and may be known by having the measured mile beacon, painted white, on its western face, and also by a cottage recently built.

The bay has irregular depths in it, 4 to 8 fathoms, rock, sand, and gravel, with rocky patches of 2¾ fathoms near the shore. Two detached reefs one cable apart and partly dry at low water, named the Slimers, lie on the western shore of the bay, 1¾ cables off the east side of the Mewstone; and on the eastern shore are two patches, named the Ebb rocks, on the western

of which, lying W. by N. ¼ N. distant 3 cables from the south point of Yealm head, is a rock nearly awash at the lowest tides, that has occasioned the loss of several vessels and many lives.

This bay is three-quarters of a mile deep and the same in width at entrance between the Slimers and Ebb rocks, but it can only be considered as a roadstead for vessels bound into the Yealm. Near the entrance of the latter are two tidal ledges that materially reduce the space of navigable water in the bay; viz., Church ledge, which projects two cables from the shore in a S.W. ½ S. direction from Wembury church, and Mouthstone ledge, one cable N.W. by W. from the inner point of Yealm head.

The Breakwater lighthouse in line with Maker church, N.W. by N., leads 2 cables south-west of the Ebb rocks; and Wembury church (square tower) its own length inside the west entrance of Langdon trees, N.N.E., leads about one quarter of a cable from their western side. The western hedge of a narrow field on with the eastern hedge of a woody patch in a valley behind, N.E. ¼ N., leads eastwards of the Slimers; and New Barton farm (a solitary house near the north entrance point of the Yealm) in line with the south-east angle of a hedge inland, E. ¾ N., or Rame church open south of the Little Mewstone, leads to the southward.

The RIVER YEALM has its entrance in the north-east corner of Wembury bay 2½ miles E. by S. from the peak of the Mewstone. It is easy to be made out from being at the commencement of a long easterly range of cliffy shore, and from the dark zig-zag line marking its course through the coast ranges of 300 feet in height. The entrance between Season point on the north and the inner point of Yealm head on the south is 1¾ cables wide, and inside this line vessels drawing 12 feet and waiting tide should not proceed. Season point is a steep cliffy head, with a black rock at its south-west face.

From the entrance the general direction of the river is E. by S. ½ S. three-quarters of a mile to Warren point, the average width at low water one cable, and depth 9 feet; thence to Stert point the direction is N.E. ½ N. 1¼ miles, the average width three-quarters of a cable, and the depth 10 feet. At Stert point, which is singularly woody and low, the river ceases to be navigable at low water even for boats, and it here divides into two arms, the Cofflet and the Yealmpton. The Cofflet arm takes a northerly direction for one mile, with a high-water width of half a cable and a depth of 10 feet.

The direction of the Yealmpton arm is E. by N. 1¼ miles, when it suddenly narrows to a breadth of 50 feet, and is nearly fresh at half-tide; this width it preserves, winding its way through a rich woodland vale, in

most inviting pools and rapids, past the village of Yealmpton distant nearly one mile. Although this arm, like the Cofflet, is at low water threaded only by a small stream that would not float a boat, half way up it has a high-water width of nearly half a mile and a depth of 10 feet, and is here joined on the northern shore by another small arm which terminates in the ornamental waters of Kitley. Limestone and coal barges of 4 and 5 feet draught often discharge their cargoes at Kitley quay.

Opposite Warren point there is another branch one mile in length in an E. by S. ¾ S. direction, named the Newton Ferrers arm, which has a width of half a cable and a depth of 10 feet at high water, but at low tide there is not sufficient water for a boat. Midway on its north shore is the village of Newton Ferrers, and on the opposite shore the village of Noss; the latter skirts the steep sides of a small creek, where vessels of 100 tons burthen occasionally discharge.

The shores of this branch are formed of steep grassy slopes, here and there dotted with irregular patches of wood, which in places overhang and touch the water, rendering it difficult on still calm occasions, to discern where the true and reflected pictures meet. Such is also the general character of the banks of the Yealm, and when there is much wind, the overlooking or walling-in heights cause sudden gusts, which make boat-sailing dangerous and the handling of sailing vessels uncertain.

Directions.—The dangers to guard against in approaching the entrance of the Yealm, are the Slimers reefs on the western shore of Wembury bay; the Church ledge extending from the northern shore under Wembury church; the Ebb rocks off the outer point; and the Mouthstone ledge off the inner point of Yealm head on the eastern shore. Vessels should not attempt to enter during strong south-west winds, when frequently a line of breakers extends across from the Slimers to the Ebb rocks, and others on the irregular ground inside them.

Wembury church bearing N.E. ¼ N. will lead into the bay clear of all danger, until a small hummock on the high extreme of Warren point bears E. ¾ S., and is over the extreme of Misery point. This latter mark will lead into the entrance of the river, passing one-third of a cable northward of the Mouthstone ledge; the latter may also be cleared by keeping a clump of large trees in the valley over Cellar bay in sight or open of Yealm head.

Between Season and Misery points, and projecting from the northern shore, is an extensive sand-bank of 2 and 3 feet water, between which and the southern and eastern shore of Cellar bay is the channel of the river, only 40 yards wide, and 6 and 8 feet in depth at low water after passing the bay, the deep-water line to which lies along the southern shore. The

coast-guard look-out hut on Warren point kept open of Misery point leads through this channel, which ends at the latter point, off which a shoal of 3 and 4 feet water extends 70 yards.

At Misery point the channel deepens to 12 feet, and is on the north shore; thence to the best anchorage the deepest water is 10 and 12 feet. The part of the river most frequented for this purpose is the centre of the stream between the Ferry house and the outer point of the Newton Ferrers arm, the depth at low water being from 9 to 12 feet. The flat off Warren point which fronts the anchorage should be guarded against.

Life Boat.—A life boat is stationed at Yealm river.

Tides.—It is high water, full and change, in the mouth of the Yealm, at 5h. 37m.; springs rise 16¼ feet, neaps 11½ feet. During the freshes which occur between the months of October and February, the stream of the river abreast Warren point occasionally runs down at the rate of 4 knots; at other times its greatest velocity is 1¾ knots for the flood, and 2¼ knots for the ebb.

Stoke Point Rock.—About 1¼ miles south-east of Yealm head is Stoke point, which is a low peak with a light-coloured base; one-third of a mile eastward of the point are two conical stone beacons 6 feet high for pointing out the position of Stoke point rock, which lies S. by E. half a mile from the extreme of Stoke point, and 3½ cables from the nearest shore, with only 8 feet water on it; but with 11 fathoms close to its south side, and 8 to 4 fathoms between it and the land. The two stone conical beacons on the shore abreast it when in line, bearing N.N.E. ¾ E., point to the rock; by keeping them open a small vessel will pass clear of it on either side; the town of Cawsand open south of the Mewstone, N.W. ¾ N., leads outside it.

BIGBURY BAY is an extensive bight between Stoke point and Bolt tail, and although open to the full force of S.W. gales, is less formidable than is generally believed. Its appearance from a distance is very uninviting for a vessel to close with; but although the coast is rugged and fronted at low water by extensive rocky ledges and numerous scattered rocks, there are no dangers outside half a mile from the shore.

Generally speaking, there is an absence of any remarkable feature in the coast between Yealm head and Bolt tail, and from a distance it assumes the appearance of a line of even-topped heights, backed by the craggy tors and wild mountain features of the Dartmouth hills. Indeed, were it not for such objects as the Mewstone with its light stripe, the high yellow patch on Yealm head, the high gray cliffs between the Erme and Avon, with Borough island, it would be difficult to recognise from a distant

offing any part of this coast. On a nearer approach, the square church towers of Thurlestone and Churchstowe, as well as the sharp spires of those of Bigbury and Marlborough, will serve to identify the land in their immediate neighbourhood.

The shores of Bigbury bay may be closely approached by vessels keeping near the land for smooth water, or to avoid the offing tide; and they may also do so in thick weather or during the night, by paying strict attention to the lead. The shoalest water is in the eastern part of the bay, and then, under such circumstances, a depth of less than 6 or 7 fathoms at low tide should be avoided; 13 and 14 fathoms will be found at 2 miles off shore.

In the western part of the bay the water is deeper, there being 19 fathoms about three-quarters of a mile from the shore in the neighbourhood of Stoke point, farther westward the shore should not be approached within the depth of 10 fathoms. Off Plymouth Sound, if the water shoals from 20 to 15 fathoms, the breakwater will be distant 2 miles, and the vessel just within the 20-fathom edge of soundings.

RIVER ERME.—The mouth of this river is readily recognised by the remarkable wooded clumps over the white coast-guard buildings just within the island-shaped western entrance point, and by the solitary pilot's house inside Muckstone point on the eastern side. The river having a straight sea reach for 6 cables in a north-east direction from the bar, with a high-water width of 2 cables, appears of some importance from the offing; the bar, however, dries at low water, and it is only navigable for the above distance for vessels of 9 or 10 feet draught when the water is smooth. Coal barges thread their way up 2½ miles from the entrance, where the stream is only 20 yards wide, a width it preserves nearly to the foot of the Dartmoor hills.

This river cannot be entered when there is any swell to make broken water on the bar. The approach is by no means clear, for at 4 cables outside the bar are the Merry reefs, which dry at low water nearly across the entrance from the eastern shore; and 2 cables outside them, and three-quarters of a mile from Muckstone point, is Edwards rock with only 5 feet water, from which the white stone beacon, close to the northward of the pilot's house, is in line with the west extreme of the point bearing E. by N. ¾ N.

The pilot's house kept its own breadth open of the head, and in line with Kingston four firs (a small solitary group on a high back ridge) is a safe lead towards the bar, passing westward of Edwards rock, and between the Merry reefs and Roadstead point.

Wells Rock, with only 7 feet water, is the most outlying danger

on this part of the coast. It lies half a mile from the shore, between the mouths of the Erme and Avon, and from it Ringmore church appears over the west corner of a small sandy beach, East, and the summit of Borough island bears S.E. ¼ E. 1½ miles.

RIVER AVON.—Between the rivers Erme and Avon, a distance of 3 miles in a south-easterly direction, the coast is composed of whitish cliffs, from 200 to 300 feet high, having their base fronted with projecting ledges and numerous scattered rocks. Near the Avon the cliffs become lower, and are separated by small bays, with sand and shingle beaches; in Challaborough cove, the first of these bays westward of the Avon, there is a coast-guard station, and limestone vessels discharge there in very fine weather. Across the entrance of the river, which is only navigable for vessels of 9 or 10 feet draught, is a bar which dries, so that it cannot be entered when there is any swell. From the high, dark, cliffy eastern head, a sandy tongue of land and spit extends well over towards a bend in the shore close within the western head. This low tongue makes a sudden and awkward turn in the direction of the channel, and causes a great rush of tide by contracting the width of the stream.

The Avon equals in beauty any of the South Devon rivers, particularly above Aveton Giffard, 4 miles within the entrance, where it runs between wooded shores till its character changes to a mere wild moor-side brook. In the low and navigable parts below Aveton Giffard, at certain times of tide, it has the appearance of a noble sheet of water, with open woodland shores, broken here and there by a bay or creek. Coal barges and cargo boats discharge at Aveton Giffard, but the limestone and coal vessels which carry all the import trade, seldom go above the village of Bantham, one mile within the entrance. These vessels often lose weeks waiting for a favourable bar and wind to get out.

Borough Island, which is connected at low water by a sandy neck to the western entrance point of the Avon, is a high rounded lump, resembling Looe island. A rocky ledge, which dries at low water, extends 2 cables in an easterly direction from its eastern point, and nearly one cable from the ledge, or 3 cables from the point, is a dangerous sunken rock, known as the Blind Mare.

Tides.—It is high water, full and change, in the mouth of the Erme, at 5h. 40m., and in that of the Avon at 5h. 47m. The entrance to both these rivers becomes dry long before it is low water outside, and the tides within their bars rise 5 and 6 feet less than they do outside, which is 16 feet. Where the rivers cease to be navigable, the springs rise 7 feet.

outhward, the coast recedes, forming a bight, the cliffs
o the eastward and become broken into heads, which are
xtensive rocky ledges. In the depth of this bight, and
e Avon's mouth, is Horsewell bay, which has a long sand
emarkable for its low shore, as well as having near its sout
us perforated rock, named the Thurlstone, resembling f
ie hull of a stranded ship.

Thurlstone is connected with the shore at low water by
nd between it and Ilbert head, the north point of the bay,
he Books, which dries at low water, and has proved fatal t
g boat. Between this reef and the ledge extending fron
the only clear entrance into the bay, not more than 1¼ cable
fathoms in it at low water. There are 3 fathoms in the m
, and limestone vessels discharge in its south corner w
s smooth. Near the centre of the bay, on the northern
surrounding the Thurlstone, there is good boat landing

coast from Horsewell bay to Bolt tail is high, precipito
particularly near and in Hope cove, which is one quarte
ly within the Bolt tail, and as an anchorage is only sa
winds. The holding ground is not good, though it is free
a stopping place. The coast-guard flagstaff on a dark rock
ar hill-side chapel, are objects by which this cove may be

Boat.—A life boat is stationed at Hope cove.

stone and Gregory Rocks.—The Hamstone is a

head, E.S.E., leads to the southward of them. Vessels sailing along the part of the coast between Bolt head and the Hamstone, should keep outside this mark, as there are several dangerous rocky heads in this space.

BOLT HEAD, 416 feet high, is 3¾ miles S.E. ¾ S. from Bolt tail, and between them a succession of dark rugged-looking cliffs rise abruptly to the height of 400 feet; thence to the eastward land of the same height, with few trees, and intersected by deep ravines, falls back into Salcombe bay, but it rises less abruptly from the shore than it does westward of the head. Excepting in the neighbourhood of the Hamstone and Gregory rocks, the ground is clear between Bolt tail and Bolt head, and the shore may be approached to one quarter of a mile, but there is no anchoring ground.

SALCOMBE HARBOUR.—The entrance to this small, well-sheltered, bar harbour, between Bolt head and Prawl point, may be recognised by the sudden turn to the northward of the cliffs at Bolt head, at the base of which are two conical high-water rocks, named Great and Little Mewstone. Vessels of 20 feet draught can cross the bar when the sea is smooth at high-water springs, and 16 feet at high-water neaps. Salcombe is a small thriving town, and its population is about 1,600. There are three building yards; and one at Kingsbridge, a small country town at the head of Salcombe river.*

The Range is the name given to an anchorage at the entrance of Salcombe harbour, but it is open to the southward. The best position is with Woodville house in line with Lambury point N. by E. ¾ E., in 6 or 7 fathoms, sand and shell. Should it come on to blow from the southward, weigh immediately, as a heavy sea is then thrown in, when it would be difficult to work out, and unsafe to cross the bar.

Rickham Rock is of small extent, with only 11 feet water; it lies one quarter of a mile off the eastern shore of the Range. Sandhill cottage open of Lambury point, and in line with the bend of the road on west side of Salcombe hill, N. ¾ W., clears the rock on its western side.

The Bar across the entrance of Salcombe harbour is a ridge of sand extending from one quarter of a mile above the Great Eelstone, a high overhanging rock on the western shore, to Lambury point on the eastern; and at low-water springs there is 6 feet. A heavy sea breaks over it in southerly gales, when allowance must be made for the scend of the sea in crossing. The lead will be the best guide, for, having passed the bar, the water will deepen immediately on either side.

* *See* Admiralty plan, Salcombe river, No. 28; scale, $m=7$ inches.

Wolf Rock is of small extent, lying on the eastern side of the channel, within the bar. It dries at low-water springs, and from it the summer-house on Pilworthy point is in line with Portlemouth ferry-house, N.E. by E. ½ E.; and the cottage on south side of Southsand bay is just showing open of the south point of the bay, W. by N. Old Harry beacon open eastward of Charles fort (ruin) leads westward of the rock.

The Poundstone is a large mass of rocks on the west side of the channel, and the centre of their highest part, which covers at 12 feet rise, is marked by a white beacon with ball. At the beacon Woodville house is in line with the east side of Charles fort, from which it is distant 180 yards.*

Old Harry, the southern extreme of the rocks extending from Sandhill point, is marked by a white beacon with ball; the rock covers at 6 feet rise. Charles fort stands on the inner part of these rocks.

The Blackstone is a large rock lying on east side of channel, and just covers at high-water springs; its western end is marked by a red beacon with ball. The channel between Old Harry and the Blackstone is 120 yards across.

Tides.—It is high water, full and change, at Salcombe, at 5h. 41m.; springs rise 15 feet, neaps 11½ feet. The stream turns at high and low water by the shore, and sets fairly in and out of the harbour; its greatest velocity at springs being 2½ knots.

Life Boat.—A life boat is stationed at Salcombe.

Directions.—Pilots are generally in attendance at the entrance of Salcombe, and should be employed by strangers. To cross the bar in the deepest water, keep well over on the western shore and steer in with Molt point, in line with a clump of trees in Northsand bay, and also on with the bend of the turnpike road on the west side of Salcombe hill, bearing N. by E. Immediately the bar is crossed, bring a small thatched summer-house, in trees, on Sandhill point, in line with the west side of Charles fort, N.N.E. ¾ E.; this will lead nearly up to Poundstone rock, and the vessel will then be near the beacons. Leave the red beacon on the starboard and the white beacons on the port hand going in, and keeping in mid-channel, proceed up to the anchorage off the town.

Should the beacons be washed away, keep the last mark on until the whole of Southsand bay is open, then bring the thatched summer-house in line with the east side of Charles fort, and keep it so until Portlemouth Ferry house is in line with the west tangent of Scoble copse,

* A buoy marking the Atlantic cable of the Anglo-American Telegraph Company is placed near Splat cove.

E. by N. ½ N.; this will lead in the best channel nearly up to Woodville house, after which keep in mid-channel to the anchorage.

There is a channel with not less than 4 feet at low-water springs, to the eastward of the Wolf and Blackstone rocks; but it is narrow and winding, and should not be attempted by strangers.

Signals.—A signal staff is erected on Prawl point; vessels making their numbers by the commercial code of signals are reported by telegraph.

CHAPTER IV.

START POINT TO THE NEEDLES.

VARIATION IN 1882.

Dartmouth - - -	19° 50′ W.	Portland road - -	19° 25′ W.
Exmouth - - -	19° 50′ W.	Poole harbour - -	19° 7′ W.

START POINT may be recognised by its rugged, cock's-comb-like appearance, and by the white granite lighthouse, 92 feet high, standing 140 yards inside of its eastern extreme. The five hillocks on the ridge within the lighthouse are each about 200 feet above high water; Peartree head, at three-quarters of a mile westward of the point, is 386 feet above that level.*

The only dangers in the vicinity of Start point to the south and south-west are, the Peartree, the Start, and Cherrick rocks; the two former are close to the shore; the latter lies S. ¾ W. upwards of 2 cables from the point, and is awash at low-water springs. A sunken rock, with only 12 feet over it, lies at the same distance S.E. ½ S. from the light-house, and to avoid it a vessel should not shut in the village of Haulsands with Start point, until Peartree rocks open out south of the Start rocks, when by giving the latter a berth of about 2 cables, she may proceed to the westward.

LIGHT.—The lighthouse on the Start exhibits, at an elevation of 204 feet above high water, a *revolving* white light of the first order which attains its greatest brilliancy *every minute*, and in clear weather should be visible from a distance of 20 miles. The light is screened towards the land, and is visible from seaward when bearing from S. by W. ½ W., round by the west and north, to East.

A *fixed* white light is shown from the same tower, at 23 feet below the *revolving* light, to guide vessels to Dartmouth and Berry head. It is seen only when Start point bears from W. ½ N. to S.W. ¾ W., and shows brightest on approaching from the eastward, and from a position one mile outside the east end of the Skerries. By keeping on its western limit, it will lead between the Skerries and the land; its other limit passes 2 cables south of the Skerries.

* *See* Admiralty chart, Dodman point to Portland No. 2,620; scale, $m = 0{\cdot}5$ inch.

Fog Horn.—During foggy weather the fog horn near the lighthouse will give one blast *every three minutes.**

SKERRIES BANK.—Nearly one mile E. ¼ S. from the Start lighthouse is the south extreme of the Skerries, a dangerous bank of pulverised shell and fine gravel, which extends N.E. by E. ¾ E. 3½ miles, with an average breadth of half a mile. Near its south end there are only 9 feet water, on the other parts from 2 to 4 fathoms, with occasionally deeper casts. The shoal terminates to the north-east in a sand-bank, nearly one mile in length, with 3 fathoms on its shoalest part. In boisterous weather the sea breaks heavily on all parts of the Skerries, but particularly upon the south-west end; there is no shelter between it and the land in strong easterly winds, as the broken water reaches to the shore.

Directions.—Berry head open of Downend point, bearing N.E. ¼ N., leads eastward of the Skerries; Street church in line with the highest part of Street-head cliff, and a little open of the north end of Slapton beach, N.N.W. ½ W., leads northward; the Mewstone peak just open of the high land of Downend point, N.E. by E. ¼ E., leads between the Skerries and the land; the west end of the trees over Widdecomb house in line with the northern white house in Beesands, N. by W. ¾ W., leads between Start point and its south-west end; and Prawl point open of Start point W. ¼ N., clears its south end.

To avoid this bank at night, do not stand towards it into less than 25 fathoms at low water. To pass between the bank and the land, keep the *fixed* light on Start point S.W. ½ S., and pass the point at the distance of one quarter of a mile on its northern side, and half a mile on the southern. When the Start light bears W.N.W., the vessel will be southward of the Skerries.

START BAY is within the Skerries, and its shore is bordered by a beach 5 miles in length, extending from Haulsands to Street head. The whole of this bay, within the clearing marks for the Skerries, affords good anchorage in 7 to 8 fathoms, over sand and gravel, except in strong easterly winds and within half a mile of Start point, where the ground is rocky; and the tide which runs to the southward nine hours out of the twelve, might set a weak-handed vessel on shore in getting under way before she is fairly under canvas, if too close in.

Start point shelters Start bay with the wind to the westward of S.W., but if it should veer to the southward of S.S.W., weigh and run for

* The Trinity House, London, has given notice that it is intended to make, at an early date, the following alteration in the character of the fog signal at Start Point:—

During thick or foggy weather, the signal will give *three blasts* in quick succession *every three minutes* in the following manner:—The *first blast* a *high note*, the *second* a *low note*, and the *third* a *high note*.

Dartmouth or Torbay, as a heavy sea is thrown in by south-easterly gales. In the northern part of the bay there is a sunken rock, with $3\frac{1}{4}$ fathoms over it, named, the Earlstone, lying upwards of half a mile W. by S. $\frac{3}{4}$ S. from Combe point. The Outer Combe rock, 11 feet above high water, in line with the Blackstone at the entrance of Dartmouth, N.E. $\frac{1}{2}$ E., leads eastward of the Earlstone; and the boat house in the centre of Blackpool bay well open of Stoke point W. by N. $\frac{3}{4}$ N. leads to the southward.

Start Bank, lying 7 miles to the southward of Start point, is about one mile in length north and south; and though the least known depth is 29 fathoms, the sea over it is much agitated during spring tides.

DARTMOUTH HARBOUR.—From Start point towards Dartmouth the coast is generally low, rising gradually in the interior. The entrance to Dartmouth is 5 miles S.W. by W. of Berry head, and its position may be recognised from seaward by the granite peaks or tors, which break the outline of the Dartmoor range. The most remarkable of these are the Haytor and Rippon tor; the latter, 1,525 feet above high water, being easily distinguished from the former by its single culminating point or cairn; whilst Haytor on the contrary presents a forked or jagged appearance. Rippon tor bearing N. $\frac{1}{2}$ W. leads to the entrance of the harbour, which, as the land is approached, will be more distinctly recognised by the tall square tower of Stoke Fleming church, standing conspicuously on high ground about $1\frac{3}{4}$ miles westward of the entrance, and also by the Mewstone, a remarkably rocky islet, three-quarters of a mile to the eastward.*

The town of Dartmouth stands on the right bank of the estuary of the river Dart near its embouchure in the English Channel, where it forms a spacious harbour capable of containing a large fleet of ships of the greatest draught. The entrance to the harbour is narrow, and protected on its west side by a battery, built on the site of an ancient castle, whence in former times a chain was extended to a castle on the opposite shore of the entrance, for the purpose of defence.

The picturesque old church of St. Petrox, with the castle adjoining it, stands out in bold relief on the brink of the precipitous rock at Battery point, on which is a new fort, at the western side of the entrance; and a low square tower, Kingswear castle—the sea face of which is white—also near the water's edge on the opposite or eastern side. Blackstone rock, 8 feet above high water, lying one cable S. by E. $\frac{1}{2}$ E. from Blackstone point, is also a useful object for a clearing mark for the shoals near the entrance.

Although the entrance to Dartmouth is only 220 yards wide from rock to rock, it opens out within the points into a safe and commodious harbour

* *See* Admiralty plan, Dartmouth harbour, with views, No 2,253; scale $m = 10$ inches.

of considerable capacity for vessels of any draught. Outside the points the character of the coast both east and west is a steep and rocky shore, dangerous to approach in boisterous weather, and fatal to be cast upon, without one yard of sand or shingle on either side for miles, on which a vessel could be safely beached.

This port affords great facilities for obtaining supplies of all descriptions, including excellent water. There are good building yards, with two patent slips and a powerful steam tug; and, as there is a rise of tide of 14 feet, great convenience for steamers to coal alongside New Ground quay, which only dries at low-water springs. The patent slips are, one 450 feet, the other 250 feet in length, and capable of taking vessels of large burthen.

The number of vessels belonging to the port in 1879 amounted to 107 representing 13,472 tons, and 8 small steam vessels. The river Dart is navigable by vessels of 150 tons, as far as Totnes, a distance of 10 miles. The principal articles imported are timber, grain, coal, sugar, &c.; and exported, cider, potatoes, stone, oak and elm timber. In 1871 the population of Dartmouth was 4,978.

LIGHTS.—On the northern or Kingswear side of Dartmouth harbour, is a tower from which at an elevation of 85 feet above high water, is exhibited a *fixed* light, showing white over the fairway entrance to the harbour through an arc of $9\frac{1}{2}^{\circ}$, between the bearings from seaward of N. $\frac{1}{2}$ W. and N. by W. $\frac{3}{8}$ W.; *red* between N. by W. $\frac{3}{8}$ W. and the land to the north-east, over the shoals of Castle ledge and Kettle point; and *green* between N. $\frac{1}{2}$ W. and the land to the south-west over the Pin rock and Checkstone shoals. In clear weather the light should be seen from a distance of 11 miles.

At the distance of 110 feet seaward of the above light, is a staff, from which at an elevation of 70 feet above high water, a *fixed* white leading light is exhibited; and the two lights in line N. by W. leads through the middle of the fairway channel.

After passing between Castle and Kettle points, a *fixed* white light near the Coast-guard station, at the southern end of the town of Dartmouth will indicate the fairway to the anchorage; this light will show *red* over the shoals on the north side of the harbour, and *green* over the shoals off One Gun point on the south side.

Beacon.—A beacon or day mark in the form of a truncated pyramid 80 feet high, stands on the high land, about 500 feet above the sea, about half a mile N.E. by N. from the outer Froward point, at the eastern side of the entrance to the harbour.

Pilots.—Many experienced pilots belong to the port, and during the summer months, from daylight until dark, they cruise outside the entrance of the harbour.

Life boat.—A life boat is stationed at Dartmouth.

Anchorage.—Outside the entrance of Dartmouth harbour, within Blackstone and Froward points, is a small roadstead named the Range, which may be used as an occasional anchorage. The holding ground is excellent, with water of moderate depth, and little tide; but as it is open to winds from S.S.E. to S.S.W., it should not be resorted to as a place of refuge. With strong southerly winds on an ebb tide, the sea breaks heavily across the roadstead; and indeed there is generally a heavy swell, with anything like bad weather, in the offing. If caught there with the wind from the southward, and blowing hard, a vessel has no alternative but to slip and run into the harbour.

There is good anchorage in the harbour anywhere above One Gun point, the usual place being near the town off the New Ground in 22 feet water, which is to be preferred if a vessel is to remain any time, as most convenient for obtaining supplies, and being entirely out of the way of vessels entering; but if the harbour is only resorted to for temporary shelter, or for the sojourn of a day or two, the anchorage lower down is the best, in 7 to 10 fathoms between Old Dartmouth Castle and Warfleet cove, from which position it will be comparatively easy for a sailing vessel to get to sea on a flood tide, when it would be scarcely possible to do so from the upper anchorage.

According to a regulation made, August 1876, by the Dartmouth harbour commissioners all vessels entering the harbour are requested to moor on the eastern side of the harbour, east of the fairway buoys. The space on the western side of the fairway buoys and abutting on the town of Dartmouth is reserved as a fairway, and no vessel will be permitted to moor therein, except such as require to communicate with the wharves for the purpose of discharging or taking in cargo or passengers or for the temporary purpose of cleaning or repairs.

DANGERS on WESTERN SHORE.—There are many dangerous rocky patches which render the approach to Dartmouth somewhat critical to a stranger. It will be well, therefore, to call attention to their nature and position, with the best marks for avoiding them, before any general directions, for sailing in and out of the harbour are given.

Combe Rocks.—A group of rocks lie immediately off Combe point, and many of them are at all times above water, and all of them show at low tide; the outer rock of the group, the outer Combe, lies rather more than one cable from the shore, and dries at half tide. When seen it may be approached without fear, having deep water all around it, and indeed, at all times in daylight, from its proximity to the Old Combe rock always above water, and from which it is distant scarcely half a cable to the eastward.

Mag Rocks.—One quarter of a mile N.E. by N. from the Outer Combe rock, a succession of high heads show themselves from half ebb to

low water; these are called the Mag or Mica, inside of which no vessel should venture. Kingswear castle open of Blackstone point, N.E. ½ N., leads eastward of these heads as well as the Outer Combe, and all dangers between Combe and Blackstone points.

Homestone Rocks.—A patch of rocks, dangerous even to small vessels, lies one quarter of a mile E.S.E. from Combe point, leaving a safe deep-water channel between them and the Combe rocks. The highest head of the patch is named the Homestone, over which there is not more than 4½ feet at low water. From it Kingswear castle is in line with the highest point of the Blackstone rock, N.N.E. ½ E.; and a high and remarkable needle rock at Combe point is in line with Stoke Fleming church. Kingswear castle open east or west of Blackstone rock, clears it on either side; and Stoke Fleming church in line with the extreme of Combe point, leads to the southward. A buoy painted with black and white stripes is moored about half a cable south-eastward of the rocks.

About 127 yards N.E. of the Homestone buoy is a patch, with only 17 feet at low water, which should be carefully avoided by vessels of large draught. St. Petrox church just open of Blackstone point N. ½ E. leads half a cable to the eastward.

Pin Rock, about half a cable in length, lies one third of a mile eastward of Homestone rocks, with Blackstone rock and point in a line. The least water on the rock is 27 feet, so that it can only be deemed a danger to vessels of large draught, or when a heavy sea is running. There are from 7 to 10 fathoms close to and around it.

In a line between Pin and Blackstone rocks, and one quarter of a mile distant from the latter is a small rocky patch with 25 feet water.

Blackstone Rock has already been alluded to, but care should be taken when passing it, to avoid a sunken rock about 70 or 80 feet off its eastern point. Although small vessels with local knowledge occasionally run between Blackstone rock and point, it is attended with considerable risk, for a shoal-head of only 5 feet water lies nearly in mid-channel; the following observation, however, may perhaps be useful, viz., that except the rocks off Blackstone point nothing dries at low water; and as there is a rise of 16 feet, a vessel may in case of necessity use this channel at or near high water, taking care, in doing so, to keep closer to the rock than the point.

Checkstone Rock.—A group of rocks some never covered, and most of them dry at low-water springs, extend a considerable distance from the shore, a little to the southward of Battery point, and as the narrowest

part of the channel is approached, the outer one, named the Checkstone with only one foot water over it, greatly encroaches upon the fairway, A black and white chequered buoy marks its position, but as there are as little as 13 feet water to the eastward of it, the buoy should not be too closely approached. Kingswear point touching Battery point N.N.W., leads eastward of the 13 feet patch.

A small detached rock lying near Dartmouth castle, but too close in to be of much importance, completes the dangers on the western side of the entrance from Combe point to the anchorage.

DANGERS on EASTERN SHORE.—The outlying dangers on the eastern shore of the entrance to Dartmouth are scarcely less in number and importance than those which have already been described on the western side.

The Mewstone, a rocky islet 125 feet above high water, lies about 1½ cables off shore, a little to the eastward of Outer Froward point, and is steep-to on its eastern side, but the channel between it and the land should never be attempted. If from any cause a vessel is carried through by the tide she must be kept as nearly as possible in mid-channel, as the rocks dry off for a considerable distance on both sides.

The Verticals.—Beyond the many high rocks extending from the Mewstone in a westerly direction, is a ledge of dangerous rocks, running parallel with the coast a full quarter of a mile west of the Mewstone. Some of these rocks, which are named the Verticals, from their high and precipitous sides, show at low water.

The west rock of the Verticals dries only at the lowest tides, and as there is a considerable rise of the ground with only 24 feet water on it, upwards of one cable to the westward, it will be prudent, from the suspicious nature of the bottom, and the set of the flood tide, to give this locality a wide berth ; Kingswear castle well open of Inner Froward extreme point N.N.W. ¼ W., leads westward of the 24 feet rise.

As the water suddenly deepens to 10 fathoms to the southward of the Verticals, the lead is of little value ; but in daylight a good clearing mark is, the East Blackstone well open of the Mewstone E. ½ N., which will also lead to the southward of all the dangers off Dartmouth. The East Blackstone, the Mewstone, the high rock near it south of the Shooter, the Verticals, the Pin (nearly), the Homestone, and the rocks off Combe point, lie in line ; as do also the Mewstone, the Shooter, the Bears tail, the Castle ledge, and the Blackstone.

Bears Tail Rock lies rather more than half a cable south of Outer Froward point, and dries at low water ; but as it is out of the proper

track of vessels, it needs no farther notice than to point out as a warning to small craft, or boats intending to run between the Mewstone and the shore, that Kettle and Inner Froward points in line lead over it, as do also the highest peaks of the Shooter and Mewstone.

Old Castle Rock.—A patch of sunken rocks lies upwards of one quarter of a mile westward of Outer Froward point, and a little less than that distance from Inner Froward point, with a good channel for small vessels inside it. On this patch, however, there are several shoal heads, two of which require to be particularly noticed. The inner head, named Old Castle rock, has only 4 feet water, and from it the ruin of the old castle at Dartmouth, which stands at the southern end of the town, is seen touching Battery point.

Castle Ledge, the outer head of the rocks off Inner Froward point, has only 8 feet water, and lies with the lighthouse under Beacon hill, just touching Kettle point; and the peak of the Mewstone over the south tangent of the Shooter.

The Mewstone peak open of the Shooter leads to the southward; and the castle flag-staff in line with mount Boon house, or Battery and Kingswear points touching N. by W. $\frac{3}{4}$ W. leads to the westward. The latter is the fairway mark up to Battery point, and leads eastward of the Checkstone. Beacon hill in line with Kingswear castle and outside Inner Froward point, N.N.W. $\frac{1}{2}$ W., clears the tail of the Verticals, the Bears tail, and leads inside Old Castle rock.

A black buoy is moored half a cable S.W. by W. $\frac{1}{2}$ W. from the Castle ledge.

Kettle Rock.—From Castle ledge to Kettle point the shore is clear aud bold, but 60 feet outside the point is a small sunken rock, with only 3 feet water over it. The Kettle rock, which dries at low water, lies inside the point, close to the shore.

TIDES.—It is high water, full and change, in Dartmouth harbour, at 6h. 16m.; ordinary springs rise 14 feet, neaps 10 feet. At Ditsham it is high water 6 minutes later than at Dartmouth, the rise is the same. At Totnes, 24 minutes later than at Dartmouth; springs rise $10\frac{3}{4}$ feet, neaps $6\frac{1}{2}$ feet. At Blackstone rock and Castle Ledge buoy, or anywhere within the Range, the stream turns with the tide on shore, but at the Homestone about $2\frac{1}{2}$ hours later.

From half a mile to one mile outside the Homestone the flood sets to the southward of the Mewstone; but at the Homestone its direction is about E.N.E. for Inner Froward point until within a few yards of the shore, gradually becoming weaker as the land is approached. Thence it turns to the southward, running close in-shore inside the Castle ledge, acquiring strength as it rounds Outer Froward point, which having passed

it sweeps to the eastward inside the Mewstone, the rate varying from one to 2 knots.

At Castle ledge buoy, the first of the flood by the shore sets about S.E. by E. direct for the Verticals, and meets the last of the Channel ebb as soon as those rocks are passed. The flood splits at Blackstone rock, anywhere within which it curves gradually outside the Checkstone buoy towards the entrance, and runs sluggishly until within the points.

The principal eddy on the flood is that which runs alongs the eastern shore round the Froward points, but there is also a slight eddy running down close to the rocks between Brook hill and Kettle point. Along the western shore the tide is weak on the flood outside the harbour; but a strong eddy runs inside the points, which commences 2 hours after low water by the shore, from the coast-guard station to One Gun point.

The ebb sets obliquely across the harbour, from the ferry slip at Kingswear towards the coast-guard station, which stands in the bight about half-way between the town and One Gun point; thence it runs out between the points, and sets in a southerly direction until past Castle ledge, where it is met by the offing ebb, with which it mingles, and is deflected to the westward running outside the Homestone.

There is a strong eddy on the ebb, in the bight from Kittery corner to abreast One Gun point, of which the pilots are glad to avail themselves in light southerly winds, when it would be difficult to reach the anchorage without it. A weak eddy tide will also be found between One Gun point and St. Petrox, but it extends only a few yards off shore. Both the strength and breadth of the eddies depend much upon the velocity of the stream, every varying according to the state of the tide and the freshes, and which require at all times much caution and a pilot's experience when entangled in them.

DIRECTIONS.—When seeking refuge in Dartmouth harbour in a gale between S.W. and S.E. if in Start bay or to the westward of Dartmouth, keep about one mile from the shore, and run to the eastward till the entrance opens out, which it will do on a N.E. by N. bearing; continue on till Dartmouth castle is in line with a large house on mount Boon, bearing N.N.W.*—or Battery and Kingswear points touching—which will lead in the fairway for the entrance.

When about 1½ cables from Battery point, steer midway between the points and anchor in from 7 to 10 fathoms off Warfleet cove one quarter of a mile within the entrance. At night keep in the sector of white light between the bearings of N. ½ W. and N. by W. ⅜ W., and when the leading light is seen, bring it in line with the upper light N. by W., and continue on through the fairway channel of the entrance, until well within the sector

* *See* view B on chart.

of white light on the Dartmouth side, when steer for it, and select an anchorage as convenient.

If to the eastward of Dartmouth with a south-westerly wind, run for Torbay, the only secure anchorage in bad weather between Dartmouth and Portland.

Sailing vessels sometimes experience considerable difficulty in getting in and out of Dartmouth, partly owing to the perplexing eddies at the entrance, but more from the baffling winds which blow off the high land, sometimes with considerable violence, especially if the wind be westward of N.W., when it requires all the experience of a skilful pilot. The true winds are N.W. and S.E., and as a general rule, in moderate weather, with the wind between N.W. by N. and N.N.E., and S.W. and S.E., a vessel will be found pretty well under command.

The channel between Combe rocks and the Homestone, under some circumstances, may be used with advantage, particularly with scant westerly winds. Turning in or out of the harbour with baffling flaws, the truest wind will be found on the opposite side of the Range from which it blows.

A stranger should not attempt to work into the harbour, particularly at night, without a pilot; but by attending to the marks in the daytime with a fair wind, or in a steam vessel, or at night by keeping in the white sectors of light, there can be no great risk in running almost in any weather.

The river above Dartmouth, being winding and intricate, is only used by vessels drawing less than 10 feet, and to navigate between its banks and shallows, local experience is needed. The Anchorstone, a half-tide rock, lies 1½ miles above the town, in a direct line between Ditsham Rectory boat-house and Greenway boat-house, one third over from the west bank; on its western side are 8 feet water, and on its eastern 12 fathoms.

In a sailing vessel great caution should be observed, particularly in light winds, when leaving the harbour and bound to the eastward, not to be caught by the flood tide near Outer Froward point, as it would be likely to set the vessel either inside the Mewstone or on the Verticals. In most cases, without a commanding breeze, she would have to trust to her anchors in foul ground. When the East Blackstone is open south of the Mewstone, safety is pretty certain; the latter islet may be rounded to the southward within a moderate distance.

The Coast from the Mewstone trends in a north-east direction 4½ miles to Berry head, with high undulating land. To the northward it rises to a height of 490 feet one mile within Sharkham point, the pitch of which is 213 feet high. At Scabbacomb the summit of the cliff is 420 feet above high water; again at Downend point, where the cliff is 200 feet high, the land rises, half a mile in the interior, to 510 feet. Between the

Mewstone and Berry head the shore is dangerous to approach within half a mile, there being in this space the following steep and dangerous rocks, having 6 and 7 fathoms water near them.

East Blackstone Rock, 10 feet above high water, lies one mile S.W. by S. from Downend point, but has no outlying dangers.

Boatfield Rock, with 9 feet water, lies off the south-eastern extreme of Downend point, about 2 cables from the shore. A projecting rocky point, half a mile to the southward of Sharkham, open of Downend, N.N.E. ¼ E., leads to the eastward.

Nimble Rock, with only 3½ feet water, and steep-to, lies about one third of a mile off shore, a little south of Downend point. From it Start lighthouse is in line with the East Blackstone S.W. ¾ W., and the north-east tangent of Downend point is in line with the highest part of Scabbacomb cliff. The lighthouse open east of the East Blackstone, leads eastward of the rock; and open west, leads between it and the land.

Mudstone Ledge lies S.S.W. ½ W. one mile from Berry head, and about half that distance eastward of Sharkham point, and on its outer end, there are 4¼ fathoms. Hope Nose well open of Berry head N. by E. ¾ E. leads to the eastward.

Cod Rocks are two steep and rocky islets 50 feet high. The outer one bears S. by W. ¾ W. one third of a mile from Berry head, and is one quarter of a mile off shore; there is no channel between them and the land.

Directions.—When navigating between Start point and Berry head keep the latter open of Downend point bearing N.E. ¼ N. to avoid the Skerries. When abreast the Mewstone, keep Hope Nose well open of Berry head N. by E. ¾ E., and it will lead eastward of all the dangers between Dartmouth and Berry head.

Between Dartmouth and Berry head the stream turns in-shore an hour earlier than in the offing.

TORBAY lies between Berry head and Hope Nose, distant 3¾ miles, N.N.E., and S.S.W. of each other. Berry head, a limestone cliff, steep-to and nearly vertical, is 180 feet high, with a flat or table summit, and may be seen in clear weather from a distance of 20 miles; quarries are extensively worked on its northern face. Near Hope Nose, on the northern shore of the bay, are three rocky islets, named the Orestone, with a small rock half a cable from its south point, the Thatcher, and Flat rock; and to westward of these are the Morris Rogue, East Shag and West Shag rocks. The bay affords good shelter from westerly winds, but the mariner is warned against being caught in it by a south or south-easterly gale as

they throw in a heavy sea. The three tidal harbours of the bay, viz., Brixham, Paignton, and Torquay, should not be run for with on-shore gales.*

Brixham.—The fishing town of Brixham, with a population of more than 7,000, stands on the southern shore of the bay, 1¼ miles within Berry head, and has a pier harbour dry at low tide, but with 10 to 15 feet in it at high-water springs. Its surplus dues partly defray the cost of a breakwater, about one quarter of a mile eastward of the entrance, which extends 320 yards from the land, affording shelter to small vessels; there is a depth of 3 fathoms at low water at the end. There are several ship-wrights' yards at Brixham, and upwards of 14,000 tons of shipping belong to the port, besides a large fleet of trawlers, averaging from 35 to 50 tons. Water pipes are carried to the ends of the new pier head and east quay; the new pier head is approachable at any time of tide by boat.

Vessels intending to enter the outer harbour should not bring the break-water light to bear westward of S.W., and vessels intending to enter the inner harbour should steer for the green light on pier head leaving it on the starboard side a few feet distant.

On the western shore of Torbay, and on the north side of Roundham point, is the small pier harbour of Paignton, which has from 10 to 14 feet in it at high-water springs, but dries at low tide.

Torquay.—The town of Torquay stands on the northern shore of Torbay, at the meeting of two deep valleys. It has an inner and outer harbour; the former dries at low tide, but has from 10 to 15 feet in it at high-water springs; whilst the latter formed by the pier run out about 250 yards in a westerly direction, from the south end of the town near the baths, carries a depth of 8 to 18 feet at low-water springs.†

A warping buoy is moored about 120 yards N.W. by W. ½ W. of the outer pier end.

LIGHTS.—A small *fixed green* light is exhibited from an iron stand, 20 feet above high water from the inner pier head of Brixham harbour, visible in clear weather 6 miles. A fixed *red* light visible 3 miles is also shown from the outer end of the breakwater now under construction.

At Torquay there are two *fixed* lights, one showing *red* on the end of the outer pier; the other showing white seaward and *red* to the westward placed on the southern pier head of the inner harbour. Both lights may be seen in clear weather from a distance of 5 miles.

The Ridge, the only foul ground in Torbay, is a small rocky patch with 3¼ fathoms least water on it, from which the Thatcher is in line with

* *See* Admiralty plan, Torbay, No. 26; scale, $m=4$ inches.

† *See* plan of Torquay harbour on Admiralty chart, No. 26; scale, $m=18$ inches.

Hope Nose, N.E. by E. ¼ E., and Smoky House mill (a ruin) is in line with the western fall of the red cliff on the southern side of Roundham point, N. by W. ½ W.

Anchorage.—Avoiding the Ridge, the whole of Torbay affords good anchorage in 6 or 7 fathoms over mud and clay, sheltered in all winds from N.E., round by the north, to S. by W., and even to S.S.E. if a berth be taken up in-shore on the southern side of the bay, but it is open to the eastward, and south-easterly gales send in a heavy sea; yet Brixham road having an underset to windward, that strengthens with the wind, affords easy riding.

Hence this is a favourite anchoring ground, and more shelter will be found from south-westerly winds with Brixham church and pier head in line bearing S.W. ¼ S., and Berry head between South and S.S.E. Large ships should not anchor farther southward than to have Paignton church on with Roundham point, N.W. ¼ N.; nor farther westward than the high part of the Thatcher over the narrow neck of Hope Nose, N.E. ½ N. Here they will be sufficiently out to secure an offing, in case of a south-east gale. Should a vessel be obliged to run on shore in the south-west angle of the bay, there is a little bight named Elbury cove, a beach sheltered by rocks; by running for this many crews have been saved, and the vessels subsequently got off; while others driven on shore to the northward have become total wrecks.

Life Boats.—A life boat is stationed at Brixham, and another at Torquay.

Tides.—It is high water, full and change, in Torbay, at 6h. 0m.; springs rise 13½ feet, neaps 10 feet.

DIRECTIONS.—Entering Torbay from the southward, Berry head, which is steep-to, may be rounded at any convenient distance. With the exception of Shoalstone point, off which a reef extends about one cable, the whole of the south shore of the bay is clean, and the soundings regular.

In running for Brixham harbour by day, vessels must keep outside the red buoy, which marks the outer end of the breakwater; and if making for the harbour from the eastward at night, keep well to the northward of Shoalstone point, until the *red* light on the pier opens out; the light then kept S.W. will lead in clear of the end of the breakwater.

A vessel bound into the bay from the northward may, if necessary, pass mid-channel between the Orestone and the Flat rock off Hope Nose, as the passage has from 5 to 9 fathoms water in it. The Orestone kept its own length open of the Thatcher, E. ¼ S., clears the rocks and foul ground on the northern side of the bay; and this bearing with the whole of

Torquay pier open of Beacon hill, N.N.E. ¼ E., marks the anchorage in Torquay road.

BABBACOMBE BAY is 1½ miles northward of Hope Nose, and in westerly winds affords good anchorage in 4 to 5 fathoms over sandy bottom; thence to Portland bill the anchorage off all the small towns is sheltered only from northerly winds.

On the beach at Babbacombe bay a fishermen's light is placed, showing *red* to seaward, *green* N.E., and *white* S.W.

TEIGNMOUTH, at the mouth of the river Teign, is half way between Torbay and Exmouth, N. by E. ½ E. 4½ miles from Hope Nose, and 39 miles N.W. by W. ¾ W. from the bill of Portland. The river falls into the sea through a narrow channel, obstructed by a bar which nearly dries at low-water springs, and is ever changing from the effects of the strong freshes and southerly gales. From the Ness on the south side of the entrance to Ferry point on the north side, the distance across at high water is only one quarter of a mile. The Ness is a beautiful headland of red sandstone clothed with verdure, rising boldly from the water's edge to the height of 174 feet. Ferry point which terminates the promenade named the Denn, is a long low tongue of loose shingle, changing with every gale of wind.*

The channel into the river is nearly straight, about half a cable wide at low tide, and the most water will be found on the south side. It lies between two sands, which uncover considerably. Spratt sand on the north side of the channel, is by far the most extensive, and the high head of fine shingle heaped up near its outer end, but which changes with the weather is named the East Pole. The Pole or Ness sand is on the southern shore and dries above one quarter of a mile outside the point.

There are no rocks on the north side of the channel, but many patches of large loose blocks of red sandstone extend the whole way round the Ness up to the anchorage in Shaldon pool, the limits of which are imperfectly pointed out by two rough buoys painted red; the western patch is named the Bench rocks.

As the bottom is entirely free from rocks at the entrance, a vessel can anchor outside the bar according to her draught; but it may be well to observe that the shoal water extends a long way outside the sand heads, and as little as 12 feet may be expected at one third of a mile from the Ness. To ensure 18 feet at low water, Berry head must be kept open of Hope Nose, which will lead upwards of half a mile outside the sand heads, and be found a safe turning mark for a stranger between Torbay and the harbour.

* *See* Admiralty plan, Teignmouth, No. 2,213; scale, $m = 15$ inches.

Apart from the attractions of Teignmouth as a watering place, with its railway station in the heart of the town, it is fast becoming a port of considerable commerce. In 1879 there belonged to the port 39 sailing vessels representing 4,744 tons, and two small steam-vessels. In the same year 687 vessels of an aggregate tonnage of 72,263 tons entered the port. A steam tug is attached to the port, and there are two patent slips.

A Life Boat is stationed on the Denn.

LIGHTS.—The lighthouse inside Ferry point on the south-west end of the Denn, exhibits from an elevation of 34 feet above high water a *fixed red* light which may be seen in clear weather from a distance of 6 miles, and serves to point out the position of the harbour at night; a small shifting *red* light is placed in one of the houses behind it. The two lights in line clear the rocks off the Ness and the highest part of the Pole sand, and lead up to the fairway, the approach to which can alone be estimated by a bearing of the land and attention to the lead.

Tides.—It is high water, full and change, at Teignmouth, at 6h. 0m.; springs rise 13 feet, neaps 9½ feet. Outside the bar the time of high and low water is about 25 minutes earlier, and there may be six inches more rise and fall.

On the bar, the flood stream makes into the river near half an hour after low water by the shore, and before the banks are covered sets up the channel with a velocity of from three quarters to 1½ knots; but as the tide rises its direction is over the Spratt sand, which should be allowed for when working into the harbour with light winds.

The tide has no great strength until near Ferry point, round which it sweeps from half tide to nearly high water at the rate of 4 to 5 knots, causing strong eddies near the beach on both sides. Inside Ferry point, at half tide, the flood flows over the east end of Salty flat, and at or near high water makes nearly a straight course from Ferry point to the bridge, running from half to 1½ knots.

In much the same way the course of the ebb stream depends entirely upon the state of the tide. From the bridge the first quarter ebb runs over the low part of Salty flat for Shaldon pool: but as the tide falls, or a little after half ebb, it drives through the channel with considerable velocity, much influenced by the quantity of fresh water in the river. Under ordinary circumstances its average rate is as follows:—From the Swing bridge to the moorings, one to 1½ knots; below the moorings, 3 knots; at Ferry point, 5 knots, slacking immediately after passing the Ness; and over the bar, from one to 2½ knots.

There is no eddy on the ebb on the western shore below the Bench rocks, for the true stream runs close past them, as it does also on the opposite

side near Ferry point. On the bar the first and second quarters ebb set about E.N.E.; and after half tide S.E., meeting the true tide a short distance outside the bar.

Directions.—It would be most hazardous to trust to Teignmouth for refuge in bad weather, for the ground swell which generally precedes a southerly gale, soon becomes a heavy breaking sea as the wind increases. If unable to cross the bar, which would be attended with much danger and difficulty, the only alternative is to secure an offing as quickly as possible bearing in mind that no shelter is to be found between Dartmouth and Portland road.

As the sands are constantly shifting, no leading marks can be depended on with certainty; but as buoys are not laid down to mark the channel at the entrance, it may be useful to know that the south arch of the bridge, or the junction of the staging with the masonry, which is very observable, just shut in with the outer end of Ferry point, will lead over the bar, and towards Spratt sand. This course should be continued until the lighthouse is in line with the coast-guard flagstaff; then haul over for the Shaldon shore, steering for the south house in Shaldon, until the north-west house or tangent of the houses comes in line with the above arch, which will lead up to Shaldon pool in mid-channel, and abreast the fairway buoys on the starboard hand.

From this position the channel to the moorings off Teignmouth, where vessels may ride in from 10 to 12 feet at low water, is marked by seven buoys on the edge of Salty flat, viz., four red, one striped black and white, one black, and one red, all of which must be left on the port hand. A large red barrel buoy is placed at Ferry point; but as the sand at low water dries for a short distance beyond it, give it a tolerable berth in rounding the point. There is room for a few small craft in Shaldon pool, out of the way of vessels entering the harbour; the best berth is abreast the south end of the town a little above the Bench rocks, out of the strength of the tide.

A swing opening through the bridge admits vessels drawing 11 feet to the upper part of the river, but the principal part of the traffic is carried on in barges; for these, and even small vessels, there is water communication the whole way up to Newton, and a channel has been cut and buoyed for the purpose.

DAWLISH is a small but fashionable watering place between Teignmouth and Exmouth. The town is in one of the numerous valleys for which this coast is celebrated, and with the parish church and a few villas, stands half a mile from the sea.

The Dawlish rock, with 11 feet water, lies abreast the town, nearly

half a mile off shore, with Exmouth church, just open of Warren point, N.E. by E., and Mamhead tower and coast-guard flag-staff in line N.W. by W.

A fishing light is shown during the season.

EXMOUTH HARBOUR.—The river Exe falls into the sea at the bottom of Lyme bay, the extreme points of which are Hope Nose and the bill of Portland. A floating dock 530 feet long, and 300 feet broad has lately been opened at Exmouth, and opening from it is a dry dock 250 feet long by 34 feet in breadth and having 12 feet over the sill at high-water springs.*

The canal leading to Exeter commences one mile below Topsham, and is 5 miles long, 13 feet deep, and 30 feet wide, terminating in a lock and basin, the first 120 feet long, and 28 feet wide; and the basin, which is opposite the quay at Exeter, 917 feet long, 18 feet deep, and from 90 to 110 feet wide. Vessels must lighten to 12 feet before they can enter the canal. At Topsham there is a dry dock, 190 feet long, 42 feet wide, 32 feet between gates, and 10 feet over sill at high-water springs, and 7 feet at high-water neaps; there is also a steam tug.

The mouth of the river Exe bears N.E. $\frac{1}{2}$ N. 12$\frac{1}{2}$ miles from Berry head and N.W. by W. $\frac{1}{4}$ W. 35 miles from the bill of Portland. Within the mouth is the harbour of Exmouth, which is difficult of access at all times, unapproachable in a heavy sea, and should not therefore under any circumstances be depended upon for refuge in stormy weather. The town of Exmouth is one mile within the entrance, and its population is about 7,000.

The approach to the entrance is between a long sandy point named Warren point, on the western side, extending 1$\frac{1}{2}$ miles from Langstone point, and Orcomb point on the eastern side, rising about 60 or 70 feet above high water. Warren point is covered with coarse grass, and abounds with rabbits. The channel is very narrow, with a long shallow bar of broken water, bounded on its north side by a fringe of dangerous rocks uncovering only at low water, and on the other side by far spreading treacherous sands.

Fairway Buoy.—A buoy striped black and white horizontally, with a staff and globe, is moored in 5 fathoms, one mile outside the entrance, with Exmouth church in line with the south-eastern house on Beacon hill, N.N.W. $\frac{3}{4}$ W.; and Mamhead tower just open north of Langstone point, W. by N. $\frac{1}{2}$ N.; the tower stands conspicuously on the high land to the southward of the obelisk on Great Haldon Hill.

A Life Boat is stationed at the entrance of the harbour.

* *See* Admiralty plan, Exmouth harbour, No. 2,290; scale, $m=6$ inches.

Orcomb Ledge extends nearly one quarter of a mile from Orcomb point; and as no buoy marks its extent, it is dangerous to vessels entering the harbour. The rocks extend to the eastward as far as Straight point, and in the direction of the harbour channel for three-quarters of a mile, and dry at half tide. Various names have been given to the salient prongs of this ledge, viz.:—Orcomb ledge, Flat ledge, Page ledge, Double ledge, Long ledge, and the Congar rocks; and five black buoys mark their outward edges.

Days Ledge is a small patch of rocks, which dries at low water. It lies on the eastern side of the channel, at the point under Gun cliff, near the coast-guard station, and is much in the way of small vessels; but its position is sufficiently pointed out by a black buoy placed well outside it.

Checkstone Ledge.—A cluster of flat rocks, which dry only at spring tides, lies a little above Days ledge, on the western side of the channel, and its north extreme is marked by a buoy, with black and white vertical stripes. A perch is also erected upon a small rock named the Checkstone, which is considerably within the ledge, and out of the fairway.

Pole Sand extends 1½ miles outside Warren point parallel to the opposite shore, and dries at low water to abreast Orcomb point. This sand narrows the entrance considerably, and is marked by three white buoys with black and white vertical stripes, besides the one on the Checkstone ledge.

Swashway.—Between the Warren and Pole sands, and eastward of Warren point, there is an intricate channel only available at half tide for boats and small vessels under 6 feet draught, if well acquainted with the place, and in fine weather; for with strong westerly winds, which almost always cause a swell outside, there is certain to be a heavy breaking sea on the Monster sand. It is also a convenient passage for avoiding a long and laborious pull round the Pole sand and against a strong ebb tide over the bar.

Anchorage.—A vessel can anchor outside the entrance to Exmouth anywhere near the fair-way buoy, waiting tide according to her draught and the state of the weather, keeping eastward or westward of the buoy, according to the direction of the wind.

The best anchorage within the entrance is on the western side of the harbour above the town, in a hole of deep water and comparatively slack tide, named the Bight, which is formed between the low-water sands on the western shore, and a high hard gravel bank, Bull-hill bank, to the eastward. A black buoy marks the south-west extreme of Bull-hill bank, abreast which vessels may moor in 3 fathoms at low water.

Tides.—It is high water, full and change, in Exmouth harbour, at 6h. 21m.; springs rise 12¼ feet, neaps 8½ feet. At Topsham lock the tide is 15 minutes later; the rise at springs being only one foot less, and at neaps the same as in the harbour. The tide begins to rise at Topsham about 2 hours after low water at Exmouth, when it has risen nearly one foot at the latter place.

Soon after low water, the flood makes at the entrance, and sets about one knot, fairly up the channel until the banks are covered, increasing to 2½ knots abreast the church, and to 5 knots off Ferry point, where it has acquired its greatest strength, which decreases considerably as the Bull-hill bank is approached.

The ebb within the harbour turns with the tide by the shore, and for the first two hours sets across the Warren and Pole sands; over the former it runs 2½ knots until past Warren point, when its strength decreases, and it crosses the Pole at the rate of little more than one knot. The stream turns to the eastward when free from the influence of the harbour shoals.

As the banks uncover at about 2½ hours ebb, the tide sets fairly through the channel with considerable strength, at least 5 knots abreast the Ferry; it crosses the outer end of the Pole sand at the rate of about 1½ knots, but when clear of the shoals, it scarcely runs one knot.

Throughout the ebb by the shore, between Exmouth bar and Straight point, the direction of the stream is E.S.E.; the tide is rotatory at that point.

Directions.—Approaching the entrance of Exmouth harbour from the southward bring Exmouth church to bear N.N.W. ¾ W., or in line with the south-east house on Beacon hill, and this mark will lead up to the fair-way buoy.

The entrance should not be attempted without a pilot, but with a leading wind, if compelled to do so, leave all the black buoys on the starboard, and the striped black and white buoys on the port hand; but the channel is winding, and under any circumstances as little as 5 feet at low water must in all probability be crossed. The atmospheric engine chimney at Starcross (a tall and conspicuous red tower,) in line with Exmouth point, bearing N.W. ¾ N., will lead westward of the first striped black and white buoy on the Pole sand, and up to the anchorage off the town.

To anchor in the Bight, the above course must not be continued farther than to have Orcomb point in line with the point below Gun cliff near the coast-guard station, which may be run with until the upper coast-guard boathouse, the first building northward of the baths, comes in line with the ornamental villa named the Temple, remarkable from its Grecian design. These two in one will lead clear of the Warren and the ridge; when the low point of Orcomb is observed to be coming on with the perch on the

Checkstone and the high tangent of Warren point, haul to the northward for the Bight, and anchor by the lead anywhere abreast the black buoy of the Bull-hill bank. A pool of deep water runs up from the Bight to Starcross, in which vessels may lie with 6 or 7 feet at low water.

Approaching the entrance from the westward, after rounding Clerk point and a remarkable rock outside it named the Clerk, keep Exmouth church well open of Warren point, N.E. ½ E., to pass eastward of the Dawlish rock. Abreast Clerk point, at half a mile off shore, the fair-way buoy bears E. by N. ¼ N. when it will be in line with Straight point, and distant 4 miles. Between Clerk and Langstone points, the low water rocks dry more than one cable from the shore with a gradually shelving bank outside them.

A good turning mark up to the fair-way buoy is, to keep the whole of the town of Exmouth open of Warren point, and not to open Mamhead tower northward of Langstone point, which precaution will avoid the Pole and shallow flat sands westward of it; but the soundings are regular, and a common attention to the lead, making due allowance for the rise or fall of tide, will always afford sufficient warning.

Entering from the eastward steer for Straight point, which may be rounded with safety at one quarter of a mile; then keep Mamhead tower in line with the houses at mount Pleasant, which rises a little to the northward of Langstone point, bearing about W. by N. ½ N. This, although a close mark, is a safe one with a fair wind for clearing the ledges between Straight and Orcomb points, and also leads well inside the fair-way buoy, and up to the fair-way mark for entering the harbour.

As the entrance of this harbour is not lighted it cannot be run for with safety at night.

A fishing light is shown from the obelisk during the season.

Life Boat.—A life boat is stationed at Exmouth.

BUDLEIGH SALTERTON.—The coast from Exmouth trends eastward 15 miles to Culverhole point; it then curves in a south-east direction 24 miles to the bill of Portland. Between Exmouth and Culverhole point are the three watering places, Budleigh Salterton, Sidmouth, and Seaton, neither of which have any trade, but colliers in fine weather anchor abreast them, and land their cargoes on the beach.

The village of Budleigh Salterton stands about three-quarters of a mile westward of Otterton point, in a narrow dell running obliquely to the shore. Between the village and the point is the river Otter, a small rivulet, whose mouth, barred by an accumulation of shingle, is about 60 feet wide at high-water springs, and has then a depth of 6 feet. Approaching the anchorage off the village, be careful to avoid Foot Clout rock, with only 2 feet water, lying half a mile S.E. by S. of the chapel:

also Otterton ledge, which runs off one quarter of a mile S.W. ¼ W. from Otterton point.

The obelisk in Bicton park in line with the coast-guard watch-house on the shore, N.N.E., leads westward of the Foot Clout; and Sidmouth church open one quarter of a point of the land east of Otterton point, leads in 3 fathoms water outside Otterton ledge; but all the rocky ledges between Straight point and Beer head will be avoided by keeping half a mile off shore.

SIDMOUTH is 4½ miles E.N.E. of Budleigh Salterton, in a valley running nearly at right angles to the coast, and is bounded by Salcombe hill, 535 feet high, to the eastward, and by High Peak, 500 feet high, to the westward. The Sid, a mere streamlet, flows close to the east side of the town, but its entrance is choked by the shingle beach, the water merely percolating through the bank to the sea. A small white light is shown near the beach on the west side of creek.

Life Boat.—A life boat is stationed at Sidmouth.

BEER HEAD is a precipitous chalk cliff, 426 feet high, the westernmost in England. On the eastern side of the head is a confined anchorage sheltered from northerly winds. The best position for anchoring is with Beer head W. ¾ S., and Beer village N. by W. ¾ W., in about 5 fathoms over sandy bottom.

AXMOUTH.—Between Beer Head and Haven cliff, is the broad and fertile valley of the Axe, apparently the ancient bed of a large river, though at present only an insignificant stream flows into the sea. At the entrance of the river Axe there is a small pier and landing quay; whilst under Haven cliff, which forms a prominent object from seaward, is a dock, which is said to accommodate vessels drawing 12 feet water.* A short distance westward of the pier, stands the village of Seaton, which is favourably known as a pleasant watering place.

LYME REGIS HARBOUR.—At 3 miles eastward of Culverhole point and N.W. by N., 22 miles from the bill of Portland, is the small pier harbour of Lyme Regis, which dries at low tide, but carries a depth of from 9 to 12 feet at high-water springs. The Cobb or pier, a substantial stone structure, shelters small vessels within it from south-westerly gales; whilst the inner pier and north wall protect it from the swell caused by gales from the south-eastward. From the Cobb end, in the same line as the Cobb, there is a sharp point of loose stones, the outer end of which is marked by a beacon.

* Axmouth harbour is the private property of Mr. W. Trelawny Hallet, who gave notice, 12 April 1877, that the piers, quays, and other works had been greatly damaged during a gale, and that in consequence the harbour was unsafe for the use of ships or boats.

A Life Boat is stationed at Lyme Regis.

LIGHTS.—A *fixed red* light is show on the inner pier head of Lyme Regis harbour, and another light, also *red* at the custom house. They are 275 yards apart in a N.W. ½ N. and S.E. ½ S. direction. The light at the pier head is 12 feet, and the other light 21 feet above high water, and both may be seen in clear water from a distance of 4 miles.

Tides.—It is high water, full and change, at Lyme Regis at 6h. 21m.; springs rise 11½ feet, neaps 8½ feet. At one mile southward of the harbour the stream makes to the eastward at 4h., and to the westward at 10h.; its greatest rate is only one knot, with an interval of slack water.

Directions.—To enter the harbour at night, the high *red* light kept a little open eastward of the low *red* light, N.W. ¼ N., will clear the outer Cobb end, and lead to the inner pier heads. By day, steer for the beacon placed at the extreme end of the reef projecting from the outer pier head, and give it a berth of 20 or 30 yards in passing. In strong southerly winds the sea breaks heavily round the piers; the proper place then for a wrecked crew to take the beach would be at the back or eastern side of the north wall, where the boat would most probably be driven.

High Ground, and Pollock, are two rocky shoals, about three-quarters of a mile apart, with 6 fathoms water between them, lying westward of Bridport harbour. The High Ground, the westernmost shoal, lies W. by N. ½ N., 1¼ miles from Bridport pier heads, and about half a mile off shore; it is half a mile in length, 1¼ cables broad, and has only 9 feet water near its south-east end. The Pollock is a smaller shoal about 1¼ cables in diameter, and nearly circular; it lies W. by S. three-quarters of a mile from the pier heads, and has 11 feet over its shoalest head.

Marks.—Puncknoll knoll, a conical hill 587 feet high, having a small house on its summit, in line with the low end of the east and last cliff to the eastward of Burton coast-guard houses, S.E. by E. ½ E., leads to the southward of both the High Ground and Pollock. Down hall, a large white house, in trees, on the northern side of Bridport, in line with Bridport pier head, N.E. by N., leads eastward of the Pollock; the west end of North hill, 376 feet high, the first hill inland of Bridport east cliff, in line with the pier head E.½ S., leads between the shoals; and Thorncomb peak, 509 feet high, N.E. ¼ N., leads to the westward of the High Ground.

BRIDPORT HARBOUR.—This small but secure pier harbour, lying 16½ miles N.N.W. ¼ W. of Portland bill, has 14 feet between the pier heads at high-water springs, but the entrance nearly dries at low tide. The piers are 50 feet apart, and form a straight canal-like entrance, in a

[illegible]

[illegible]

[illegible]

[illegible]

Tides. [illegible]

WEST BAY, [illegible] on the north-west side of Portland, is [illegible] between [illegible] and N. by E., and is therefore [illegible] waiting [illegible] to get round the Bill; but the water is deep, and it cannot be recommended as a safe anchorage for large vessels, for should the wind suddenly change to the westward, a heavy sea soon gets up, and the holding ground is bad, being loose gravel or shingle.

There is anchorage in any part of the bay. Small vessels anchor off the south end of Chesilton village, one third of a mile off shore, in 8 or 9 fathoms, over clay bottom, with Portland high lighthouse touching Blacknor point, S. by W. ¼ W. Good shelter will be found about 1½ miles off shore in 17 fathoms, coarse gravel and shells, the Bill bearing South, and the steep shoulder of the Verne about E. ½ S.

Tides. It is high water, full and change, at Chesilton, in West bay, at 0h. 15m.; springs rise 10½ feet, neaps 7 feet. In the middle of the bay, the stream makes to the south-eastward at 1h. 40m., and to the north-westward at 10h. 40m., thus setting towards the Bill nine hours out of twelve, with a velocity of 2 knots, which rate is rapidly increased as the

Bill is approached. The duration of the northerly set does not exceed a couple of hours, and runs with scarcely any appreciable force.

Directions.—Great caution in necessary, if at anchor in West bay, to guard against a sudden shift of wind to the westward and south-westward, for such winds send in a heavy sea, against which few anchors would hold or few vessels could atempt to beat with any prospect of success; for although the tide sweeps strongly along the cliffs to the southward, its influence is too closely confined to the shore to produce any advantageous effect on vessels striving to gain an offing. A vessel, however, may, between the periods of half-flood and half-ebb, work out of the anchorage with the wind to the southward of S.S.W.; and the attempt might succeed from half-ebb to half-flood, provided the wind was to the northward of W.N.W.; but no reliance should be placed on this alternative, as a vessel on all occasions would be much safer at sea.

Although there is no sensible indraught into West bay, a vessel embayed in a S.W. gale should endeavour to keep off shore until the eastern stream makes, then with the assistance of the tide endeavour to round the Bill, and passing within the Shambles make for Portland harbour of refuge. If the western stream is running, and she cannot be kept off shore, attempt Bridport harbour, and if this harbour cannot be entered, beach the vessel close to the eastern side of its piers.

BILL of PORTLAND, bearing East 48 miles from the Start, is the south extreme of Portland peninsula, which is 3½ miles long, N.E. and S.W., and 1½ miles wide at its broadest part, near the centre. The peninsula is connected with the adjacent coast by a narrow isthmus of coarse shingle, the eastern end of a remarkable raised beach known as Chesil bank. The isthmus is 40 to 45 feet above low water, and 650 feet across from West bay to Portland road. The Vern, near the north end of the peninsula, is elevated 488 feet above high water, whence the land slopes gradually to the south-west, terminating in the Bill; the whole presenting a remarkable wedge-like appearance, invaluable to seamen, as a point of recognition in sailing up or down Channel.*

Portland peninsula contains large quantities of freestone,† and its valuable quarries are extensively worked. Near the centre is St. George's church, the top of which is 390 feet above high water, and with the two

* *See* Admiralty charts: Weymouth and Portland roads, No. 2,255, scale, $m=4$ inches; Portland to Owers, No. 2,450, scale, $m=0{\cdot}5$ inch; and Portland to St. Albans head, No. 2,615, scale, $m=1{\cdot}36$ inches.

† The sea is perpetually encroaching on the peninsula; in 1665, 1734, and 1792, portions of the cliffs and of the land having been undermined, fell into the sea; and at the present time the east side loses nearly one foot annually, on an average, in most parts.

[redacted]

Although this passage is frequently used by small vessels, it should be borne in mind that there is a strong eddy tide or 9½ hours set on the eastern side of Portland, running in a different direction to the one out of West bay. If, therefore, the vessel is so late in the tide as not to be able to get round Grove point before the fourth hour of flood, she had better anchor, to prevent being carried back again into the West bay tide, or endeavour to get off shore to the eastward into the fair flood stream.

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* For light-vessels' riding lights and signals, see page 26.

At Night the leading mark between the Shambles and the Bill is the two lights in line, N.W. by N., until the fixed *red* light on the breakwater bears N. by E. ¾ E., when steer for it, taking care to keep a safe offing on approaching Grove point, and a prudent distance when passing the breakwater. During the eastern stream Portland high light should be kept open to the westward of the lower one, as that stream sets with great velocity over the Shambles; and as the western stream sets as strongly into the Race, similar precautionary measures should be taken not to be set to the westward.

PORTLAND REFUGE HARBOUR.— At 5¼ miles E. by N. ¾ N. from the north-east end of Portland is Whitenore point, and between are Portland and Weymouth roads, separated from each other by the projecting point of the Nothe, which forms the south side of Weymouth harbour.*

Portland road has always afforded safe shelter except from winds between South and East; and to guard against these a breakwater, projecting in a north-easterly direction from the north-east end of Portland, was commenced in 1849, and now offers a secure Refuge harbour easy of access by night or day. The breakwater extends 2,000 feet in an easterly direction from the north-east end of Portland, to an opening 400 feet wide; and thence it curves round and takes a N.N.E. ¼ E. direction for 7,000 feet to its north-east extreme, enclosing an area of about 4,310 acres varying in depth from 3 to 9 fathoms; the bottom is a blue slimy mud, accumulating fast, affording good holding ground.

The area included in the harbour without the 5-fathom line is 1,430 acres, in the whole of which the largest ships may anchor, sheltered from all winds; but during southerly gales the wind frequently flies suddenly round to the N.W., blowing in heavy gusts over Chesil bank, and causing a short unpleasant sea, dangerous for boats. Vessels may ride with great safty at single anchor, as there is no tide except near the opening of the breakwater. If obliged to moor, have the hawse open to the northward, with the small bower to the prevailing westerly winds, a good scope of cable out and—in winter—sheet anchor ready.†

At 1½ miles from the north end of Portland a timber bridge connects Chesil bank with the coast, at the entrance of a remarkable salt water lake, named the Fleet water, which runs at the back of the shingle beach as far as Abbotsbury. From the Fleet the shore gradually rises to the

* *See* Admiralty plan, Portland harbour, No. 2,268; scale, $m=9$ inches.

† Captain J. J. Ball, R.N., late harbour master, Portland, suggested that vessels wintering in the harbour should have their sheet anchors a cock-bill, and at the cat-heads instead of letting go from the waist.

Nothe, which is 75 feet high. On a projecting point between the bridge and the Nothe is Sandsfoot castle, whence the shore is fringed by low-water rocks, all of which will be avoided by keeping the coast-guard houses at Preston open of Nothe point.

LIGHT.—From a staff situated in the centre of the fort, at the north extremity of the breakwater, and 57 feet above high water, is exhibited a *fixed red* light, visible from seaward and over Portland harbour, but obscured by Portland peninsula between the bearings of N.N.E. and E. by N. ½ N.; the light is also visible from West bay over Chesil bank, between the bearings of E. by N. ½ N. and E.S.E.; but to an observer 15 feet above the sea approaching within 2 or 2½ miles of Chesil bank, the light will dip below the land. In clear weather the light should be seen from a distance of 8 miles. Vessels should keep one cable from the light.

Fog Bell.—During thick or foggy weather a bell will be sounded from the breakwater fort at the following intervals of time, namely, 39, 28, 27, 37, 18, and 20 seconds.

Tides.—It is high water, full and change, at the bill of Portland, at 6h. 35m., and low water at 12h.; springs rise nine feet, neaps 6½ feet. At Portland breakwater at 7h. 1m.; springs rise 6¾ feet, neaps 4½ feet.

DIRECTIONS.—With the Shambles light vessel, or light in sight, there is no difficulty in approaching Portland harbour by day or by night. It will, however, be requisite during the western stream, especially in light winds, to give the east end of the Shambles a wide berth by keeping Wyke Regis church well open of the north-east end of Portland, to insure not being swept over that shoal, which has in many cases proved fatal. After passing this danger steer for the Breakwater light on a N. by W. ¼ W. bearing and giving it a berth of not less than one cable in rounding. Anchor as convenient, according to the vessel's draught.

Merchant vessels should anchor westward of the line between two white-washed marks near the Harbour Master's office and the Nothe.

WEYMOUTH ROAD and HARBOUR.—Weymouth road, between the Nothe and Redcliff point, is free from foul ground and open only to winds between South and East. It is frequently resorted to in the summer and fine weather. The usual anchorage is about one mile off the town, in from 5 to 8 fathoms, over sand and gravel. Vessels should not anchor within three quarters of a mile of the northern shore of the road as the ground there is foul.*

* *See* Admiralty chart, Portland harbour, No. 2,268; scale, $m = 9$ inches.

The little river Wey divides the towns of Weymouth and Melcombe Regis, and falls in the Weymouth road on the northern side of Nothe point, from which a stone pier runs out E.N.E. nearly 200 yards and is continued 300 feet by a concrete pier 2 feet above ordinary spring tides; a black buoy, with staff and ball, is moored in 14 feet at low-water springs, about 40 feet from the end of the pier. The north side of the entrance is protected by a stone pier, running out E. by S. from the south end of the esplanade of Melcombe Regis, and from its outer end a pile pier extends 300 feet. A warping buoy is placed in 10 feet on the north side of the channel, 100 yards east of the pile pier.

The harbour carries 8 to 9 feet at low water, and 15 feet at high-water springs, but the rise and fall is considerably affected by the winds. A swing bridge connects the towns of Weymouth and Melcombe Regis, above which is a large pool, named the Back water, where yachts and small craft are laid up during the winter.

Weymouth, originally a small fishing town, has, from its excellent beach and roadstead, become a place of some importance, and is resorted to during the summer season by numerous visitors for the benefit of sea bathing. In 1871 its joint population with Melcombe Regis was 13,257. In 1879, there belonged to the port 38 sailing vessels, representing 3,870 tons, and 7 small steam-vessels; steam vessels run regularly between Weymouth and the Channel islands. There are two patent slips for repairing small vessels, and two building yards, also a tap for the use of shipping on the north quay.

LIGHTS.—On the north end of the Esplanade, about 200 yards eastward of the railway station, are two *fixed red* lights, 30 feet and 20 feet above high water, bearing from each other N. by W. ¾ W. and S. by E. ¾ E. On the north pier of Weymouth harbour are two *fixed green* lights, 20 feet high, bearing East and West of each other.

Directions.—Approaching Weymouth harbour, keep St. John's church at the north end of Melcombe Regis, bearing N. by W. to clear the Mixen rocks, which run off nearly one cable eastward from Nothe point; these, and the rocks extending about 180 feet from the north-east point of the Nothe, are the only dangers to avoid in entering the harbour. Pass the black buoy, with staff and ball, on its eastern side, and keep in mid-channel until the vessel is abreast the outer south quay, she will then be within the northern jetty and past the rocks running out from the Nothe, after which the deepest water is on the south side of the harbour.

At Night after passing the Portland breakwater light, bring the two *red* lights at Weymouth in line N. by W. ¾ W. and keep them on, until the two *green* lights on Weymouth north pier are in line West; this latter

d of the hill commences a series of low cliffs intersected with
; Redcliff point, the westernmost of these cliffs, is 150 feet
iffs gradually increase in height to Whitenore point—chall
and—where they are 542 feet above high water. The lan
ıe cliffs to the downs, and on Osmington down, 1½ mile
f point is the large figure of a man on horseback cut out of the
g white on the green slope of the hill, and visible for many
l.

reen Weymouth road and St. Albans head the shore is chi
cliff; from the latter to Peverel point dark rock, and thence
as far as Old Harry, where it abruptly declines.

gsted Ledges.—There are several rocky ledges border
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n the latter and Warbarrow head the shore is generally bc
are a few outlying rocks, which will be avoided by keeping
r hill, 674 feet high, open of Broad Bench point S.E. by E. ¾

worth Cove, 3 miles eastward of Whitenore point, is a
sin begirt by high cliffs of chalk and sand, and in cases of n
afford shelter to small vessels. The clear entrance to it is
t wide, between ledges of low-water rocks running off fro
the longest ledge being on the western side. In entering k
ver from the eastern cliff. Within the cove there are 12
ter springs, which rise 7 feet, and neaps 4½ feet.

Water.—There is a stream of fresh water and good facilities for watering in the small boat harbour at Osmington mills, a short distance westward of Ringsted point ; the west point of entrance is marked by a beacon. Water can also be obtained at Lulworth, Arish Mill gap, and in Wor cove.

Kimeridge Ledges.—From Warbarrow head to St. Albans head the coast consists of a succession of dark-looking cliffs, fringed by long flat ledges of indurated clay, some of which extend half a mile off shore. Arish Mill gap, open of Warbarrow head, bearing N.W. ½ N. leads outside them. Arish Mill gap will be known by its white sandy beach ; Warbarrow head by the small conical hill on its summit.

Between Warbarrow and St. Albans heads are two coves named Kimeridge bay and Chapmans pool, but neither affords safe anchorage.

Life Boat.—A life boat is stationed at Kimeridge bay.

ST. ALBANS HEAD, from which the bill of Portland bears W. ½ N. 15¾ miles, and St. Catherine point, E. by S. ¾ S. 28½ miles, is a bold headland 359 feet high, on the summit of which is an ancient chapel or chantry. It has generally a race running off it, particularly in blowing weather, caused by the unevenness of the ground. The overfalls extend about one mile off shore, and are sometimes found more westerly, and sometimes more easterly, acoording as the wind and tide act in concert with or against each other. There are not less than 5½ fathoms water in their vicinity, with 12 and 15 fathoms on both sides, as well as to the southward.

ANVIL POINT LIGHT.—On Anvil point about 4 miles eastward of St. Albans head is built a lighthouse 39 feet high and white in colour, which exhibits at an elevation of 149 feet above high water, a *flashing white* light, showing a flash every *ten seconds;* the light is visible seaward between the bearings of S. 85½° E. and S. 77½° W., and in clear weather should be seen at a distance of 18 miles.

PEVEREL POINT.—Between St. Albans and Durlston heads is a clear bold shore of dark-looking limestone cliffs, the quarries of which are extensively worked. At Durlston head the coast bends abruptly to the northward, forming the western shore of the deep inlet between St. Albans head and St. Catherine point.

Several rocks lie between Durlstone head and Peverel point, and vessels passing should not bring the head to the southward of S.W. by W. ¾ W., nor approach the point within one third of a mile, until Swanage church comes well open of the northern shore of Peverel point, W. by N. ¾ N. Old Harry, a pinnacle rock off Standfast point, in line with Poole head

watchhouse, which stands in the north-west angle of Poole bay, N. by E. ½ E., leads three-quarters of a mile outside Peverel ledge, which extends some distance off Peverel point, and over which a tide race runs with considerable strength. A black conical buoy is moored in 5 fathoms on the outer extreme of Peverel ledge.

SWANAGE BAY is close round Peverel point, but the anchorage in it is not much used except by small vessels in fine weather. They anchor on the south side of the bay in 4 to 6 fathoms, over fine sand, half or three quarters of a mile off shore. A pier 273 yards long and 18 feet wide extends in an easterly direction, and has on it two 5-ton cranes, with which vessels lying alongside are loaded with Purbeck stone, which is shipped in large quantities. At the end of the pier there is a depth of 18 feet water at high-water springs.

The shores of the bay rise with a gradual slope from the sea, and at the north point is the east end of the chalk range that extends across the country from Whitenore to Ballard down, where it terminates in white cliffs, which re-appear again at the Needles.

A Life Boat is stationed at Swanage.

Tides.—The first high water, at full and change, at Swanage, is at 8h. 20m., the second rise at 0h. 20m,, and low water at 3h. 20m., springs rise 6¼ feet, neaps 4¼ feet (*see* page 152).

STUDLAND BAY.—Ballard and Standfast points separate Swanage and Studland bays, and in rounding them do not approach the shore nearer than one quarter of a mile. Off Standfast point are two remarkable pinnacle chalk rocks, named Old Harry and Old Harry's Wife.

Studland bay, on the north side of Standfast point, affords good shelter for small vessels during westerly winds. The best anchorage is off three remarkable projections in the chalk cliff, named the Yards, in about 2 fathoms, with the Agglestone—a large square rock on a small hill half a mile inland—open northward of the coast-guard buildings on Redend point, W. by N. ½ N., and Shepherds hut S. by W. ¾ W. Large vessels anchor farther out according to their draught, with Studland church bearing West.*

POOLE HARBOUR.—From Studland to Poole head is a range of hillocks of drift sand, and between them is the entrance to Poole harbour, only 1½ cables wide between the Haven points, and the navigable channel not more than half that distance across. The harbour is a spacious estuary resembling at high water an inland lake, which branches in every direction into the heaths surrounding it. Its navigable channels being

* *See* Admiralty plan, Poole harbour, No. 2,175 ; scale, *m*=4 inches.

narrow and intricate, and its entrance fronted by shifting sands, it should not be attempted without a pilot.

The town of Poole, standing on the north shore of the harbour, 3 miles within the entrance, is an intricate cluster of houses, pierced by a High street one mile in length, and terminated towards the harbour by capacious quays. There is no dock, gridiron, nor patent slip; and vessels requiring to be hove keel out, are hauled down to large fixed careening blocks. Poole has a considerable foreign trade, and in 1879, there belonged to the port 47 sailing vessels, representing 5,755 tons, and 3 small steam vessels; but this number has diminished since then. In the year 1881, there entered the port 1,116 vessels of an aggregate tonnage of 75,750 tons. The chief articles of export are, manufactured goods, corn, flour, biscuit, iron, salt, clay, sanitary pipes, stone, nets, cordage, leather, &c., and Purbeck clay. The imports are, corn, timber, iron, hemp, flax, pitch, tar, oil, salt, fish, skins, wine, spirits, &c. The population in 1871 was 10,129.

Wareham stands 5 miles above Poole, between the rivers Trent and Frome, which unite at one mile below the town. The channel through the Frome, or south river, is navigable to Wareham quay for vessels of 20 or 30 tons.

LIGHTS.—On the south part of North Haven point, at the entrance to the harbour, are two *fixed* white lights exhibited from movable white houses, bearing N. $\frac{3}{4}$ W. and S. $\frac{3}{4}$ E. from each other, distant 262 yards apart. The northernmost or high light is 37 feet, and the low light 16 feet above high water, and both are visible in clear weather from a distance of 6 miles. The low light is masked between the bearing of N. by E. $\frac{1}{4}$ E. and N. $\frac{1}{2}$ E.

There are four more *fixed* lights within the entrance, but shown only during winter; namely, a white light on North Haven point, a white light near Lilliput farm, and two *red* lights at the town.

A Life Boat is stationed at the entrance to Poole harbour.

Tides.—Owing to the double high water (*see* page 152) in Poole harbour, the tide stands at a high level for about $3\frac{1}{2}$ hours. The first high water, full and change, at Brownsea island, is at 8h. 50m., the second rise at 0h. 25m., and low water at 3h. 50 m., ; springs rise $6\frac{1}{2}$ feet, neaps $4\frac{3}{4}$ feet, but both are very uncertain. At Poole quay the first high water is 20 minutes later than at Brownsea; but the second rise and low water are simultaneous at both places; the rise and fall are also the same.

At Russell quay, half way between Poole and Wareham, the first high water is 40 minutes after that of Brownsea, but the second rise and low water are 20 minutes later; rise and fall the same. At Wareham quay, the first high water is 1h. 25m., the second rise 1h. 15m., and low water

1h. 25m., later than at Brownsea; rise at springs 4 feet. From the great extent of mudlands over which the tide flows, and the number of streams that fall into Poole harbour, the tide rushes with great force through the narrow opening at the Haven points, and has there scoured out a channel, with from 6 to 8 fathoms in it at low water.

Directions.—The approach to Poole harbour, between the banks fronting its entrance, is narrow and intricate, and though great attention is constantly paid to buoying and lighting the channel, yet no stranger should attempt to enter without a pilot. Pilots are always in attendance in Studland bay.

The best and indeed the only buoyed channel into Poole harbour is that known as the Swash, which has lately been increased in width and depth by the extension of a breakwater from the shore in the vicinity of South Haven point, in order to arrest the ebb current in its passage to the sands and flats of Studland bay, and direct its course so as to scour this channel.

The least known depth in the Swash-channel is 6½ feet, and as the rise at springs is 6½ feet, the depth at high-water springs will be 13 feet. The starboard side of the channel on entering is marked by black can buoys, and the port side by cask buoys striped red and white vertically.

Approaching Poole harbour, the lighthouses on North Haven point in line bearing N. ¾ W. will lead to the outer buoy (red and white) on the bar, which may be passed close to. Then steer with the high lighthouse a little open west of the low lighthouse (the lighthouses in line lead in 4 feet over the west edge of the Hook), which will lead nearly midway between the second red and white buoy, and second black buoy, in 6½ to 8 feet water. After passing the second black buoy steer through the Swash channel with the lighthouses in line until abreast the inner red and white buoy, thence Lytchet trees in line with Brownsea coastguard N. by W. ½ W. will lead nearly in mid-channel, and when the low lighthouse bears N.E. by E. steer to pass North Haven point at about three-quarters of a cable, and anchor in Brownsea roads.

At night after passing the inner black buoy a vessel must be guided by the lights in the dwellings near Brownsea castle, taking care not to shut them in with North Haven point.

From Brownsea castle the channel is pointed out by buoys striped red and white vertically, to be left on the port hand, and perches on the mudbank on the starboard hand. The Middle ground has a ball beacon on its southern end, which must be left to port, and a red buoy on its upper end; from thence the channel is marked by perches on each side to Poole creek, which has a black buoy on the starboard side of entrance, and a beacon on the port side.

The main channel above Poole to Wareham is marked by perches on each side, and buoys at the first curve; the buoys striped red and white vertically to be left to port, and the black to starboard. Besides the main channel, the harbour contains a number of creeks, inlets, bays, and islands, for which see chart.

The beacons above Brownsea road are subject to be changed to meet the requirements of navigation.

POOLE BAY.—At Poole head the coast curves to the eastward, and thence to Hurst point are a succession of earthy cliffs intersected with deep ravines, named chines, worn away by the action of small streams. From the sort yielding nature of the shore, the action of numerous springs, and the violence of the waves, the sea is encroaching on the whole of this part of the coast, evidenced by frequent landslips, and the fall of enclosures, fields, roads and houses over the cliff.

In the southern part of Poole bay the ground is clear, and there is an open anchorage in from 6 to 7 fathoms, over sand and gravel, with Studland church bearing West 1½ miles. In the northern part of the bay, however, are several patches of dangerous rocks, with 6 and 7 fathoms between them. The shoalest head of only 8 feet water, named Inner Poole patch or Woodbury rock, lies half a mile off Poole head; the Middle Poole patch or Lobster rock, of 18 feet water, lies E.S.E. 2 miles from the high lighthouse; and another, the Outer Poole patch, with 16 feet on it, nearly 1½ miles from the Bournemouth shore, and $2\frac{6}{10}$ miles E. by S. from the high lighthouse. Arne trees—a remarkable clump on a hill 178 feet high, near the head of Poole harbour—on with North Haven point and well open south of Brownsea island, N.W. by W. ¼ W., leads southward of these dangers; and the whole of Swanage well open of Ballard point, S.W. by W., leads eastward.

Bournemouth, built on the sides of a steep and thickly wooded chine, 2 miles eastward of Poole head, is a watering place of recent creation, and consists of an irregular cluster of villas scattered through a valley. A pier, 16 feet wide, and with a T head, runs off a southerly direction 267 yards from the shore. The head, from which a *fixed red* light is exhibited, is 36 yards long, 30 feet wide, and there are 14 feet alongside the head at high-water springs.

To the westward of Bournemouth the ground is foul, and nearly half a mile off shore are Bournemouth rocks, with 14 feet, and within them is Durly rock with 8 feet water. Brownsea castle kept open of the base of Poole head, W. ¼ N., leads southward of this foul ground, and Durlston head open of Old Harry S.W. ¼ W. leads eastward. Between Bournemouth and Christchurch ledge there are no outlying dangers, and the shore may be approached to one third of a mile.

Christchurch Ledge.—Christchurch or Hengistbury head, 120 feet above high water, is 6 miles eastward of Poole head. It is composed of dark reddish-looking ironstone, and being of harder material than the coast to the westward, gives way more slowly to the action of the numerous springs and the violence of the waves; but even here it was shown, by actual survey, that 300 feet had gone from the point of the head between 1847 and 1854; this distance has since been considerably increased by large quantities of ironstone having been taken from the face of the cliff.

A narrow rocky ledge runs 2¾ miles in a S.S.E. ¾ E. direction from Christchurch head, and near the middle, at 1¼ miles from the head, a black can buoy is moored in 3½ fathoms; but it must be remembered that there are only 2¾ fathoms in the end of the ledge at twice that distance from the shore. The tower of the Priory church at Christchurch, just appearing over the east slope of Warren hill (*see* view A on chart 2,219) and bearing N. by W. ½ W., leads along the west side of the outer part of the ledge, and may be used until a vessel is half a mile from the shore; and Nodes beacon, on the Isle of Wight, in line with the junction of the red and white cliffs in Alum bay (*see* view D), E. by S. ½ S., leads southward of the ledge and of the Dolphin bank, up to the fair-way of the Needles channel.*

CHRISTCHURCH HARBOUR.—At the distance of three quarters of a mile N.E. from Christchurch head is the entrance to this shoal harbour, which is only accessible to vessels of light draught, as the bar across its entrance, formed of drift sand, often dries at the lowest tides. The bar is only 6 feet over it at high-water springs, and, as it often changes its position, a stranger should not attempt to cross it without a pilot.

The town of Christchurch stands 1½ miles within the entrance, a little above the junction of the rivers Avon and Stour. The tall tower of Priory church, 131 feet above high water, is a conspicuous object from seaward. There is a salmon fishery in the harbour, and a small amount of coasting trade is carried on in vessels of light draught.

Directions.—As none but vessels of light draught can require to round the eastern end of Christchurch ledge in order to reach Christchurch bay, they may either pass close to the black buoy above mentioned, or, attend to the following marks:—A clump of trees on a distant hill open west of High cliff trees N. by E. ¼ E., (view B,) or High cliff house N.N.E. ¼ E. crosses the ledge in 2½ fathoms; and High cliff house N. ¼ E. leads over the tail of the Dolphin bank in 4½ fathoms, and eastward of the ledge in 6 fathoms, to the anchorage off Christchurch harbour in about

* *See* Admiralty chart: Owers to Christchurch, with Spithead and Isle of Wight, No. 2,045; scale, $m = 1{\cdot}4$ inches; and Needles channel with Christchurch bay No. 2,219; scale, $m = 4$ inches.

3 fathoms, sand and mud, with Priory church in line with the Haven house and Durlston head open of Christchurch head.

Tides.—The first high water (*see* page 152), full and change, at Christchurch, occurs at 9h. 0m., the second rise at 11h. 30 m., and low water at 3h.; springs rise 3 feet at the town, 5 feet at the entrance points, and 7 feet outside the bar.

After the first high water, the tide falls nearly 1½ feet, and then rises again about nine inches. From the entrance points to the bar both tides run with great velocity. Between the last quarter ebb and the first quarter flood, the water is fresh with the points.

TIDAL STREAMS.—It is high water, full and change, at the Start, at 5h. 41m.; springs rise 15 feet, neaps 11½ feet. At the bill of Portland at 6h. 35m.; the rise 9 feet, and 6½ feet. At the Needles at 9h. 46m.; the rise 7½ feet, and 5 feet. The velocity of the stream off the Start is 3 knots, but when blowing fresh there is a strong race both on the flood and ebb, extending three-quarters of a mile off shore; at the north end of the Skerries and Downend point it runs 2½ knots, off Berry head 2 knots. In Start Bay the tides are weak and irregular, their general direction, nine hours out of the twelve, being to the southward, close to the shore.

Between Dartmouth and Berry head the stream turns in-shore an hour earlier than in the offing.

Off Exmouth bar, at three-quarters of a mile south of Straight point, at full and change, the stream turns to the eastward at 3h. 40m., and to the westward at 11h. 0m., running in the latter direction about 4¾ hours. The western stream for the first 2 hours runs W.S.W.; for the next two hours West, and it then turns gradually to the northward. The direction of the eastern stream for the first quarter is E.N.E.; at half tide, E. by N.; and the greatest velocity of both streams is about one knot.

Three miles south of Beer head, the stream turns to the westward at 10h. 30m., and runs in that direction 4 hours, then gradually turns to the northward, and runs for 2 hours between W.N.W. and N.E. by N. It may be said to turn to the eastward about 5 o'clock, and for 2½ hours, or until half tide, sets from N.E. to E. by N., and for the next three hours gradually turns to the southward. The direction of the stream in this position is, therefore, round the compass, with little or no velocity, as even at springs it scarcely runs one knot, and that only for a short period.

Two miles N.N.W. of the bill of Portland, at full and change, the tide sets as follows:—1st hour of the ebb by the shore at Portland breakwater, S. ½ E., 1¾ knots; 2d hour, S. ½ W. 1¾ knots; 3d hour, S. by W. ½ W., 1½ knots; 4th hour, S.W. by S. three-quarters of a knot;

5th hour, N.W. ¾ N., weak; 6th hour, from N.N.W. to N. ½ W., three-quarters of a knot; 7th hour, N.N.E. to E. by N., one knot; 8th hour, S.E. ¼ E., 1¼ knots. 1st hour of the flood, S.E. by S., 1½ knots; 2d, 3d, 4th, and 5th hours, S.S.E., 2 knots.

The tide therefore sets to the S.S.E. round to S.W. by S. out of the west bay of Portland, for about 9 hours, *i.e.* from 2h. 0m. to 11h. 0m. at full and change.

About 2½ miles west of Portland bill the flood and ebb streams are of nearly equal duration, setting S.S.E. and N.N.W. The eastern stream ends about 10 o'clock, which is 3½ hours after high water in Weymouth harbour, or 1¾ hours before high water in Portsmouth harbour. Five miles W.S.W. from the Bill the stream sets S.E. by E. and N.W. by W., and turn 30m. before high water in Portsmouth harbour. Six miles S.S.W. of the Bill they set E.S.E. and W.N.W., and the eastern stream ends 10m. before high water in Portsmouth harbour.

About one mile south of the bill of Portland, at half flood by the shore, the tide sets from S.S.E. to S.E. ½ E., and the opposite stream about W. by S. ½ S.; the velocity of both streams, at springs, being from 5 to 6 knots; but although the tide runs with such violence near the Race, about one mile S.W. of the Bill the tide was found weak.

At about 1½ miles E. ½ S. of Portland bill, and S.E. by S. three-quarters of a mile from Godnor point, the 1st hour of the flood by the shore sets S.W. 1½ knots; 2d hour, S.W. by S., E.N.E., and N.E. by N., weak; 3d hour, North to W.N.W., 1¾ knots; 4th hour, W.S.W. to S.W., 1¾ knots; 5th hour, S.W. 1¾ knots, gradually increasing in strength, until at the 3d hour of the ebb, it sets S.W. 2½ knots; 4th hour, S.W. ¼ W., 3½ knots; 5th, 6th, and 7th, S.W. ¼ W., 4 to 5 knots; 8th hour, S.W. ½ W., 3½ knots.

The tide therefore sets to the south-westward out of the east bay of Portland for about 9½ hours, *i.e.*, from 6h. 20m. to 3h. 50m., at full and change.

Near the west end of the Shambles, the 1st hour of the flood by the shore sets West, from half to 1¼ knots; 2d hour, E. ½ N., half a knot; 3d hour, E. by N., 2¾ knots; 4th hour, E. by N. ¼ N., 3¾ knots; 5th hour, East, 3¾ knots. At the 1st hour of the ebb, E. by S., 3½ knots; 2d hour, E. by S. to S.E. by S., 2½ to 1½ knots; 3d hour, South, one knot; 4th hour, S.W. by S., 1½ knots; 5th hour, W. by S. ½ S., 1½ knots; 6th hour, W. by S., 2 knots; 7th hour, W. by S., 2¼ knots; 8th hour, W. by S. ¼ S., 1¾ knots.

At the east end of the Shambles, the 1st hour of the flood by the shore, sets West, 1½ knots; 2d hour, from West to N. by E., weak; 3d hour, about E.N.E., weak; 4th hour, E. by N., 2 knots; 5th hour, E. by N., 2¾ knots. The 1st hour of the ebb sets E.N.E., 3½ knots; 2d hour E.N.E.,

3¼ knots; 3d hour, East, 2¾ knots; 4th hour, East and E. by N., 1¼ knots; 5th hour, East, N. by W., and W. by N., weak; 6th, 7th, and 8th, about West, from 2¾ to 2¼ knots.

In Portland and Weymouth roads the stream is scarcely sensible running with but little strength along the shore from Weymouth to St. Albans head.

At 1¼ miles S.S.W. ½ W. from St. Albans head, the western stream makes at 10h. 45m., and the eastern stream at 4h. 45m., the latter setting S.E., and the former W.N.W. to N.W. by W.; their greatest velocity being at half tide about 4½ knots.

One mile S.E. of Durlston head, the western stream makes at 10h. 25m., and the eastern stream at 4h. 25m., the former setting W.S.W., and the latter E.N.E.; their greatest velocity about 3 knots; the indraught on the flood in thick weather is dangerous to a ship not on her guard.

At one third of a mile E.S.E. of Peverel point, the western stream makes at 8h. 40m. and the eastern stream at 4h. 0m., the former setting S.W. and the latter N.E.; on the ebb there is a dangerous race over the ledge, which extends about one mile off the point. The velocity of the ebb is about 3 knots, of the flood about 1½ knots. Off Old Harry, at three-quarters of a mile N.E. by E. from Standfast point, the western stream makes at 9h. 45m., and the eastern at 4h. 10m., the latter setting N.E. by E. to N. by E. at the rate of one knot, and the western stream S. by W. to S.W., 2 knots.

INSHORE STREAMS between PORTLAND and OWERS.*—By reference to the Admiralty Tide Tables it will be seen that while it is high water at one end of the Channel, it is low water at the other end; but this inversion of the tide is sudden, not progressive; for example, the bill of Portland and St. Catherine point are only 44 miles apart, and yet it is high water at the latter when it is low water at the former, viz., on or about noon on full and change days; in fact, the whole six hours difference is confined with this space; the range of tide being nearly the same in both cases.

It is therefore important for seamen to know that not only does this inversion of tide take place somewhere near the assumed position of the Channel node or hinge of the tide at Swanage, which is equi-distant between these two places; but that in all places westward of the node it is high water, full and change, nearly at the same time, between 5 and 6 o'clock, and at all places eastward of the node between 11 and 12 o'clock.

* From observations made during the progress of the survey on the south coast of England, by Captain Sheringham, R.N. *See* Nautical Magazine for 1851, Vol. XX., page 393.

As the tidal streams turn everywhere in the Channel at high and low water on the shore at Dover, or at 11h. and 5h. full and change, the western or outgoing stream drains all the harbours eastward of the node, while it is filling those to the westward, and vice versâ, the same stream making a high or low water, according as the position is east or west of the Channel node.

Eastern Stream.—The incoming tide or outset from the west bay of Portland, runs from the time of half ebb to nearly the end of the flood in Portsmouth harbour, or from about 2h. to 11h., full and change, closely skirting the rocky shore and gradually increasing in strength as it approaches the Bill, where it acquires such velocity as to extend far beyond that point before it turns to the eastward; leaving a strong eddy stream between it and the land. Having assumed its easterly course, it rushes past the pitch of the Bill at the rate of 6 or 7 knots at springs, leaping and foaming over the broken ground of Portland ledge with great violence.

A short distance eastward of the ledge this outset is met in the latter half of its course, at nearly right angles, by the stream which sets for 9½ hours (viz.: from 6h. 20m. to 3h. 50m., full and change) out of the east bay of Portland; these united streams press on towards the Shambles which they cross obliquely about E. by N. at the rate of from 3 to 4 knots, clearly pointing out the limits of this bank by a well-defined line of broken water. At the west end of the bank the rate is quite 3½ knots for three-quarters of the tide; at the east end the average rate is about 3 knots; but for the first hour there is scarcely any tide.

The eastern stream, when disentangled from the influence of the Shambles, sets in for the coast to the westward of St. Albans head, soon, however, bending to the eastward in the direction of the shore, sweeping round that head at the rate of 4 or 5 knots at spring tides. At 1½ miles from Durlston head the stream does not appear to set into Poole and Christchurch bays, but within the distance it does so. A little farther off the head its runs for the Needles, and sets dangerously towards the Brook and Atherfield ledges, extending off the south-west shore of the Isle of Wight.

At 2½ miles off Durlston head the stream sets in a slight curve outside St. Catherine point, which it passes at about the same distance, having regained the same velocity as it had off Saint Albans head, upwards of 4 knots; to the eastward of the point it is again sucked into the deep bight between the Isle of Wight and the main, but not sufficiently so to overcome its onward course towards the Owers, as it leaves those shoals nearly 5 miles to the northward.

Inner Stream.—Within the stream of tide just described, there is during the flood an inner stream, which at half a mile inside the Shambles

sets dangerously into the bight towards the Kimeridge ledges, brushing sharply and closely round St. Albans head, whence it is deflected to the northward round Durlston and Peverel points, but with decreased strength, and having passed Old Harry expends itself in Poole bay. Thence it proceeds slowly round the bay towards Christchurch head, running smartly over Christchurch ledge, but soon relapses into its former tranquil course; as it approaches the Needles, however, it acquires increased strength, and runs over the Dolphin bank and the Shingles with considerable velocity.

This stream splits off the Needles, one portion running up the Solent, and through Spithead, while the other flows round the south side of the Isle of Wight, following every bend and turn of the coast, until it reaches Bembridge point, where at about one mile north-east of the Nab it re-unites with the other portion through Spithead; and thence these united streams set towards Selsea Bill, into Bracklesham bay, through the Looe, and over the shoals at the rate of 2 or 3 knots, according to the distance off shore.

Western Stream.—The reverse of the foregoing remarks is also applicable to the course of the out-going or western stream, which at 4½ hours after the commencement of the eastern stream in the offing, or at 9h. 30m. on full and change days has made in shore the whole way from Selsea Bill through Spithead and the Solent to Portland. It may, however, be requisite to repeat, that at any moderate distance from St. Albans head, from one to 2 miles, this stream sets for the Shambles, whereas its inshore portion runs smartly along the coast as far as Whitenore point, losing its strength in Weymouth and Portland bays. From the north-east end of Portland it rushes furiously round Godnor point towards the Shambles and past the Bill, catching up the first of the outset to the south-east out of West bay in its course down Channel.

This stream, near high water in Portsmouth harbour, divides near the Nab, one part running through Spithead, the other over the Princessa shoal and round Dunnose to the westward, until half ebb by the shore. At this period the tide has slacked at Spithead, and the rapid discharge of the last half of the ebb from Southampton water and Portsmouth harbour produces such an increased velocity in the back water as to turn or beat back from its course the stream at Spithead, converting the western into an eastern stream, which near the Nab meets the regular Channel ebb, and with it sweeps round to the southward of the Isle of Wight. Thus the ebb for the last half of its duration runs in opposite directions on the two sides of the eastern half of the island.

Indraught—Caution.—From the above description of the inshore streams, it will be seen that there is a considerable indraught on both the

flood and ebb into all the deep bights from Portland to the Owers, particularly on the flood, round Durlston head into Poole bay, and in some positions more than others, according to the distance off shore.

This indraught has a tendency of leading a vessel into danger, particularly in thick weather, if by neglecting the lead she is allowed to be attracted within its influence. With the land in sight there can be but little risk of this, for anywhere southward of the Shambles, 1½ miles outside St. Albans head, 2 miles south of St. Catherine point, and 4 or 5 miles southward of the Owers, a vessel will not be materially affected by indraught on either tide.

At night or in thick weather, suspicion should always be awakened by the appearance of a strong race or overfall, as it indicates either the near approach to some salient point, or the proximity to a shoal; and it may be generally inferred, that 2 miles outside the fair streamage of headlands, there is little or no indraught.

SECOND HIGH WATER.—The inshore stream of flood, as just observed, page 151, splits off the Needles, one part flowing round the south side of the Isle of Wight, the other through the Solent and Spithead. At 4½ hours after the commencement of the offing stream, or at 9h. 30m. on full and change days, the western stream has made inshore all along the coast from Selsea bill, through Spithead to the westward, increasing its velocity down the Solent to nearly 2 knots, and through the Needles to 3½ knots.

This western stream unites near the Nab with the last of the flood round the eastern end of the island, and together they run through Spithead, giving increased effect to the incoming stream of flood, by contributing to fill the harbours in its progress to the westward, until the stream has turned in the offing, a little after 11 o'clock, thus making a flood or rising tide of 7 hours. This not only affects the rise of tide in Portsmouth, Langston, and Chichester harbours, but it makes what is called a *second* high water in the harbours of the Solent. At Christchurch, Poole, and Swanage, it is more properly a second rise, as it takes place between high and low water. This second flow takes place at Southampton and at Hurst 2 hours, at Christchurch 2½ hours, at Poole 3½ hours, and at Swanage 4 hours, after the *first* high water.

Guldor.—The influence of the second tide continues to be felt as far as Portland, but to the westward of St. Albans head it comes so near the time of low water, and causes so small a rise, that it is called the second low water; the intermediate rise of from 5 to 7 inches being termed the guldor. At Lulworth, the first low water takes place 4½ hours after high water; the guldor then rises for 1½ hours, and the second low water occurs

2 hours after the gulder has ceased rising. At Portland breakwater the first low water is 5 hours after high water, and the second 3 hours later. At the Bill, from the constant swell, the level cannot be spoken of with certainty to inches, but low water continues about 2 hours.

This second rise or swelling of the tide ceases about 12h., full and change, or about the time that the outgoing or western stream in the Channel has acquired strength.

CHAPTER V.

NEEDLES TO SELSEA BILL.—THROUGH NEEDLES AND SOLENT CHANNELS TO SOUTHAMPTON, COWES, AND RYDE; SOUTH COAST OF ISLE OF WIGHT; EASTERN ENTRANCE TO SPITHEAD; AND PORTSMOUTH, LANGSTON, AND CHICHESTER HARBOURS.

VARIATION in 1882.

Needles channel - 18° 50′ W. | Spithead - 18° 40′ W.

NEEDLES CHANNEL.—Throughout Christchurch bay the land is low, but more especially so in the vicinity of Hurst castle, the base of which is but little elevated above the level of high water. The Needles cliffs, at the west extreme of the Isle of Wight, rise perpendicularly from the sea, and being composed of white chalk, are remarkable from the offing, when contrasted with the dark-coloured ground behind them; these, with the white lighthouse on the outer Needle rock, Hurst castle, the batteries, and two lighthouses on Hurst point, are good guides to the entrance of the Needles channel, which is bounded on the western side by the shoals named the Shingles, and on the eastern by the west end of the Isle of Wight.*

The entrance to this channel, between the west end of Bridge reef and the south-west tail of the Shingles, is nearly one third of a mile wide, the least water in it being 5 fathoms, gravel bottom. With care it may be taken under favourable circumstances by sailing vessels of large draught; steam vessels can navigate it at any time when the leading marks or lights are visible.

With the wind from S.E. by S., round southerly, to North, a sailing vessel, under most circumstances, may take the channel with confidence; but if the wind be to the eastward of South, the channel should not be attempted in sailing vessels of large draught, for the course past the S.W. buoy of the Shingles, until within the Bridge reef, is no better than E. $\frac{3}{4}$ N., and on entering the channel the wind generally draws more to the eastward. With scant south-easterly winds, it should never be attempted on the ebb; and even on the flood it cannot be recommended to work through, except

* *See* Admiralty charts: Owers to Christchurch, with Spithead and the Isle of Wight, also views, No. 2,045, scales, $m = 1 \cdot 4$ inches; Needles channel, with Christchurch bay (with views), No. 2,219, scale, $m = 4$ inches; Solent, Hurst point to Cowes, and Southampton water, No. 2,040; scale, $m = 2\frac{3}{4}$ inches.

in a handy vessel of light draught, under the management of a person possessing local knowledge.

With a smooth sea, vessels of moderate draught may cross the Bridge reef with Hurst lighthouses in line by day and the lights in line by night, bearing N.E. by E. ¼ E.; but if drawing 19 or even 18 feet these marks should not be used at low-water springs, as they would lead only half a cable distant from the shoal water on the reef.

Although the lead should on no account be neglected, it will be of little service, for the tide hustles a vessel so quickly through the channel that the seaman has scarcely time to avail himself of any warning it might afford; but a marked attention to the soundings is of the utmost importance when approaching the entrance from sea.

As a general rule, from whatever quarter this channel is approached, with the Hurst lights in sight—and it should never be attempted by a stranger unless they are in sight,—the seaman may be assured that he is nearing the entrance when the depths are under 10 or 11 fathoms, according to the state of the tide, and that even these soundings will bring the vessel close to the rocks if the lights are northward of N.E. by E. Great caution must therefore be used in approaching the Bridge reef until the lights are eastward of that bearing; the anchor should be clear for letting go at a moment's warning.

LIGHTS.—Needles.—The granite lighthouse on the outer of the Needles rocks is 109 feet high, and exhibits, from an elevation of 80 feet above high water a *fixed* light* of the first order, which shows *red* when bearing from N.W. ¼ N. (round northerly) to E. ¼ N.; *white* from E. ¼ N. to E. by S. ¾ S.; *red* from E. by S. ¾ S. (round southerly) to S.W. ¾ W.; and *white* from S.W. ½ W. to S.W. by W. The white light is visible in clear weather from a distance of 14 miles, and the *red* light 9 miles. A bell is sounded continuously during foggy weather.

The mariner should bear in mind that the white light shows in the direction of the entrance of the Needles channel, and that its southern limit, bearing E. ¼ N., passes about one cable south of the outer part of Bridge reef; and that its northern limit, bearing E. by S. ¾ S., passes 3 cables south of the Dolphin bank and 1¼ cables south of the S.W. buoy of the Shingles. The ray of white light, between the bearings of S.W. ½ W. and S.W. by W., is to clear the Warden ledge.

Hurst Lights.—The two lighthouses on Hurst point are circular in form, 52 and 85 feet high, and stand 223 yards apart N.E. by E. ⅛ E.

* The Trinity House, London, has given notice that it is intended to make, at an early date, the following alteration in the character of the Needles light:—

The light will be an *occulting* light, with an eclipse of *three seconds* duration *every half-minute.*

various names have been adopted to identify the most dangerous of the numerous shoal rocky patches which extend to a considerable distance from the shore. The large and dangerous field of rocks, named Tinker patches, bounds the north-east side of the anchorage in Totland bay, to which it affords a most valuable shelter. The least water on them, 9 feet, is near the western limit of the shoal, about half a mile off shore; and lies with the south end of Hill trees in line with Warden point.

Warden ledge is a dangerous reef of rocks which dries for about half its length at spring tides, and extends N.N.W. 4 cables from Warden point, at which distance there are only 9 feet at low tide, with deep water close to outside.

Buoy.—The buoy, can and red, lies in 5½ fathoms close to the outer edge of the ledge with Hurst low lighthouse N. by E. ¼ E.; the flagstaff of Victoria fort on Sconce point, just seen over the low part of Cliffs-end E. by N. ¾ N.; and Needles lighthouse S.W. by W. ¼ W.

Warden bank, is 3 cables long E.N.E. and W.S.W. (within the 5-fathoms line of soundings), and 1½ cables broad; it has a general depth of 23 to 30 feet, with the exception of a shoal spot of 20 feet situated near the north end of the bank, and from which Warden point bears S.E. ¼ S.; Hurst high lighthouse N.N.E. ½ E.; and Warden ledge buoy E. ½ N., distant 2 cables.*

Caution.—The clearing mark, Sconce point open of Round Tower point, leads only a few yards outside the 20-feet patch. Vessels of heavy draught therefore should keep mid-channel between the N.E. Shingles buoy and Warden ledge buoy—taking care not to bring Needles lighthouse to bear westward of S.W. ¾ W., until the whole of Victoria fort on Sconce point opens of Round Tower point.

Anchorage.—The best anchorage in Totland Bay is on its southern side, in 3½ to 4 fathoms, over sandy bottom, with the Needles point and Hatherwoord point in one S.W. by W. ¾ W.; and Nodes beacon over the west end of a small plantation at the bottom of the bay, S. ½ E. Little or no ebb tide will be felt, and the flood is not strong enough to impair the security of the anchorage.

How Reef, Ledge, and Bank.—Between Warden point and Cliffs-end distant four-fifths of a mile in a north-easterly direction, is Coldwell bay, from the depth of which How reef and ledge runs out in a direction parallel with the dangers off Warden point upwards of one-third of a mile, with a little as 6 feet water on its outer edge; and thence with a

* Found during the survey made by Staff Captain J. Parsons, H.M.S. *Porcupine*, 1880.

sweep to the northward the 2-fathom line of How bank falls back towards Cliffs-end.

As shoal rocky ground extends all the way between the outer end of Warden ledge and the off-lying rocks at Cliffs-end, vessels of even light draught should not approach nearer the shore than to have the whole of Victoria fort on Sconce point open of Round Tower point. A good berth should also be given to Cliffs-end point, as detached heads lie upwards of one cable outside it; but thence to Sconce point the shore may be approached to one cable, as there are no off-lying dangers.

The SHINGLES.—The north-east extreme of these shoals commences about half a mile from Hurst beach; and thence they extend W.S.W. nearly 3 miles, terminating in two prongs, the south-western of which is very dangerous, having only 5 feet over it at low water. The northern side of the shoals, except near the western or outer end, is of gradual slope, and the approach to it may be tolerably well ascertained by a careful attention to the lead; but their southern or channel side is steep-to, dropping at once from almost a dry bank to a depth of several fathoms. Caution is therefore requisite in approaching either side, for the numerous shallow heads, the rapidity of the tides, and the great violence with which the sea curls and breaks with the least swell, would entail certain destruction on any vessel which might have the misfortune to be driven on them.

An opinion prevails that the Shingles undergo great changes, particularly in southerly gales. It is quite certain that the crown of the bank, or the part subject to the wash and surface scour of the tide, is continually changing according to the state of the weather; for after a long continuance of easterly winds and smooth water, high banks are heaped up, which are never wholly covered with the tide, and which usually disappear after strong southerly winds, when the surface frequently becomes so completely levelled as to leave no part visible even at low water. There is no proof, however, that the main body of these shoals is subject to any alteration of consequence either in figure or extent. On the flood the overfalls may be distinctly seen on their southern edge, and during the ebb the ripple on their norther edge.

Dolphin bank is nearly 2 miles long. The shoal ground on this bank, with a least depth of 15 feet, extends within the three-fathoms line in an E.S.E. and W.N.W. direction $3\frac{1}{2}$ cables, and is about one cable in breadth; its eastern edge lies with Needles lighthouse bearing S.E. $\frac{3}{4}$ E., distant $1\frac{8}{10}$ miles, and S.W. Shingles buoy S.E. $\frac{2}{3}$ E., distant one mile.

Clearing Mark.—Milford church spire seen over white house of Westover farm N.E. $\frac{1}{4}$ E. (view C) leads clear of the west side of Shingles, and on to the shoal part of Dolphin bank.

Nodes beacon on with junction of red and chalk cliffs in Alum bay, E. by S. ¼ S., leads south of the Dolphin, and of the south-west prong of the Shingles; *see* View D. Hurst lighthouses in one N.E. by E. ¼ E. clears the southern side of these shoals as far eastward as the Elbow buoy, but leads close to it; and thence the high lighthouse must be opened southward of the low one, to clear the eastern edge of the bank. Needles lighthouse in line with Sun Corner S.E. by E. leads close south of the Shingles, in 23 feet at low water.

Buoys.—Three buoys mark the south-east or channel side of the Shingles; one is placed off the south-west prong, another at the elbow, and the third at the north-east extreme.

S.W. Shingles buoy, conical and chequered red and white, surmounted by staff and cage, is moored in 7 fathoms, with Hurst high lighthouse, its own breadth open north of the low lighthouse, bearing N.E. by E. ½ E.; Needles lighthouse in line with Sun Corner S.E. by E. ¼ E., and Shingles Elbow buoy N.E. by E. ¼ E. $1\frac{1}{10}$ miles.

Elbow buoy, can, with red and white vertical stripes, is moored in 7 fathoms, close to the edge of the bank, with Hurst high lighthouse its own breadth open north of the low lighthouse, bearing N.E. by E. ½ E.; Needles light S. by W. ¾ W.; and N.E. Shingles buoy N.E. by E. ¾ E. 1½ miles.

N.E. Shingles buoy, can, with red and white horizontal stripes, lies in 7 fathoms, near the north-eastern extremity of the Shingles, and marks the south side of the entrance to the north channel. From it Hurst high lighthouse bears N.E. by E. three quarters of a mile; Warden ledge buoy S.E. ¼ E. half a mile; and Needles lighthouse S.W.

Mineway Bank, a shoal patch of foul ground with only 12 feet water, lies at the western entrance of the North channel, between the Shingles and Hurst beach, about one third of a mile from the latter. The low lighthouse at Hurst, nearly on with the south end of the trees at West hill, leads well to the southward; and Milford church seen between the two western houses of Milford N.E., leads half a cable to the westward.

The North Head is a dangerous gravel knoll, with only 9 feet water, lying on the southern side of the North channel, and narrowing the passage between it and the beach to one third of a mile. A vessel will be abreast the knoll when Milford church bears N. ¼ E., and to the northward when the flagstaff at Sconce point opens northward of the low lighthouse E. by S. ¾ S. The extremes of Hurst and Sconce points touching lead over it.

The Trap is a small spit of sand and gravel, thrown up at Hurst point by the strong eddy tide on the ebb ; and although near the beach, and steep-to, it is much in the way of vessels, hugging the point to avoid the tide, and should therefore be given a fair berth.

TIDES.—It is high water, full and change, at the Needles, at 9h. 46m. ; springs rise 7½ feet, neaps 5 feet. At Hurst the first high water is at 10h. 0m., the second at 12h. 0m., and low water at 3h. 40m. ; springs rise 7½ feet, neaps 6 feet. The flood or eastern stream makes at 3h. 40m., and the western stream at 10h. 0m., and the velocity of both over the Bridge and in the Needles channel is from 3 to 4 knots ; but between Hurst point and the island shore 5½ knots, whilst to the southward of the Bridge it is only 2 knots.

There is no indraught into the Needles channel on the flood unless within about 1½ cables of the lighthouse. One quarter of a mile outside the lighthouse and off Sun Corner the direction of the flood stream is S.E. ½ E. about 1½ knots. The ebb sets smartly across the Bridge reef, about W.S.W., but gradually trends to the westward about half a mile from the reef, where its direction, which is the fair tide, is W. by N. ½ N., with a rate of 1½ knots at springs. The stream turns nearly with the tide on the shore at Hurst.

At the entrance of the channel, or between the S.W. buoy and the west end of Bridge reef, the flood sets directly through the fairway S.E. by E. ¼ E. towards the Needles lighthouse, but turns rather abruptly to the eastward about half-way between the south-west prong of the Shingles and the lighthouse, with a velocity at springs of at least 3 knots. It then continues to run along the island shore, sweeping the bays, and over the shoals between Hatherwood and Sconce points, at the rate of about 4 knots at springs, and nearly 3 knots at neaps. In mid-channel the flood sets fairly up between the points with about the same strength.

Near the Needles channel edge of the Shingles, the flood sets to the eastward right off the bank for some distance before it bends to the north-eastward, and thus acts as a safeguard. On this side of the channel its velocity is not great, until it begins to feel the influence of the North channel tide, when it acquires great velocity, about 5½ knots at springs and 3 knots at neaps.

It may be gathered from the above observations that all danger upon the flood lies on the island side, indeed it would be a matter of some difficulty in light winds to ground upon the Shingles with a flowing tide.

The ebb splits about one third of the way between Hurst point and Cliffs-end, one part running through the North Channel and the other setting obliquely across the Needles channel and over the Shingles, between

the N.E. and Elbow buoys with considerable velocity. In any position in the Needles channel to the northward of the Warden ledge buoy the indraught of the North channel is powerfully felt, and therefore great prudence is necessary not to get within its influence in light and baffling winds; for, if on the Hurst side a vessel would probably be swept through that channel, and if on the island side, she would be carried on the Shingles, unless quick in anchoring. The seaman's safeguard, therefore, in light winds with an ebb tide is to keep well over on the island shore until abreast the Warden buoy, and thence the tide will set clear of the Shingles.

Anywhere between Warden ledge and Sconce point a vessel will be more or less affected by the influence of the North channel tide, and therefore might be carried either through that passage, or so far to the northward as to be in danger of the Shingles. In mid-channel between Warden ledge buoy and Hatherwood point, the tide takes the course of the deep water. Abreast Hatherwood point the influence of the outset at the entrance begins to be felt, and in calm weather would take the vessel safely through the channel, between the tail of the Shingles and the Bridge reef with a velocity of nearly 4 knots at springs.

There is no appreciable tide on the ebb in the various little bays on the island side, as it is deflected by the shoals; but beyond Alum bay small vessels should not approach the Needles rocks or the north side of the Bridge reef very closely, as the tide runs over it with considerable strength.

The flood tide sets fairly through the North channel, taking the course of the deep water, and runs with great rapidity from the elbow in Hurst beach, named Put-off point, to its confluence with the Needles channel flood, which takes place about 2 cables south of the point, and distinctly shows itself by a turbulent broken sea. At the western entrance its rate is from 3 to 3½ knots at springs, and 2 knots at neaps; but from Put-off point to the eastward it increases to a race, with a velocity at springs of at least 5 knots. A strong eddy which runs between the meeting of the tides and the point must be carefully avoided, for in it a vessel would become totally unmanageable.

It has already been observed that the ebb splits about one third of the way between Hurst point and Cliffs-end. That portion which runs through the North channel sweeps gradually but with considerable force round Hurst point, causing a strong counter tide in-shore. Like the flood it follows the direction of the channel, and sweeps round Christchurch bay, gradually diminishing in strength as the narrows are past. Its rate off Hurst point is about 4 knots at springs and 3 knots at neaps, and to the westward of Put-off point from 1½ to 2½ knots. The stream turns to the westward: a little before high water by the shore, and runs about six hours each way.

At the back of the Shingles both flood and ebb are regular, and have no great strength between the S.W. buoy and the North channel. The direction of the flood is from E. by S. at the first quarter, to S.E. ½ E., which is its course at half tide, setting across the Shingles. At one mile from the edge of the bank, its greatest rate at springs is about 2½ knots, but it runs with much greater rapidity over the bank. The direction of the ebb is from N.W. by W. to W. by N., from one to 1½ knots. The turn of the stream is uncertain, but it has been found to run to the eastward from about one hour before the time of low water by the shore.

DIRECTIONS.—From about 3 miles south of the hill of Portland, an E. ½ S. course for about 15 miles, and, after passing St. Alban's head, E. ½ N. 17 miles, allowing for tide, *see* page 150, will take a vessel about 2 miles off Anvil point lighthouse, and thence to the entrance of the Needles channel. A stranger, however, when nearing the entrance should be careful to keep Nodes beacon well open to southward of the Needles lighthouse until one of the leading marks comes on.

Crossing Bridge Reef.—Vessels drawing 19 or 18 feet may cross the Bridge, with Hurst lighthouses in line, N.E. by E. ½ E., which will lead in 24 feet at low-water springs, and when well within the reef, or when the Needles lighthouse bears S.E. by E., or is in one with Sun Corner, edge a little to the northward, if the tide is flowing, to avoid being set too close to the island shore. But it should be observed that as the Hurst lighthouses in line leads only half a cable west of a depth of 21 feet, such vessels should, at low water, pass through Needles channel as hereafter directed.

As the Elbow buoy of the Shingles is approached, keep Hurst high lighthouse open its own breadth eastward of the low one; bearing in mind that the Needles lighthouse must not be brought westward of S.W. ¾ W. until the whole of Victoria fort on Sconce point opens of Round Tower point to clear the Tinker, Warden, and How ledge and bank. When Warden ledge buoy is passed, borrow a little towards the island shore to avoid the eddies off Hurst point.

After passing Cliffs-end, the seaman must act according to circumstances, recollecting that the flood sets strongly for more than half the distance to Sconce point, when it strikes across for the Lymington shore towards Jack-in-the-Basket beacon; and that from Hurst road the ebb runs for Nodes beacon until the North channel opens out, when it turns rather suddenly to the westward through that channel. There is a strong eddy on the flood close in shore on the island side.

Entering by Needles Channel.—From the southward vessels of large draught, with a fair wind, should bring Hurst high lighthouse to

bear N.E. by E. ½ E., which will lead towards the S.W. Shingles buoy, until the flagstaff of Warden fort is in line with the south end of the trees at Hill Farm E. by N. (the leading mark between Bridge reef and the south-west prong of the Shingles; *see* View E.) This will lead in not less than 5 fathoms at low-water springs; but only about two-thirds of a cable west of a small detached shoal, having 24 feet on it, and from which the S.W. buoy of the Shingles bears N.N.E. 2¼ cables. Vessels of heavy draught, therefore, should when approaching within half a mile of the S.W. buoy steer more to the northward, until Needles lighthouse bears E. by S. ½ S.; thence proceed on the leading mark as before; when Hurst lighthouses are in line N.E. by E. ⅛ E., proceed up channel as before directed.

From the westward, steer in with Nodes beacon in line with the junction of the red and white cliffs in Alum bay, E. by S. ½ S. (View D.), or the Needles lighthouse E. by S. ¾ S.; these marks will lead in 27 feet, about half a cable south of the S.W. buoy of the Shingles. The shoalest part on this line is nearly a mile west of the S.W. buoy of the Shingles. When the flagstaff at Warden point is in line with the south end of the trees at Hill farm, or the Hurst lighthouses are in line, proceed as before.

Turning through.—No vessel should attempt to turn through the Needles channel, except under able management; and in doing so it must be borne in mind that on the flood the Shingles is the safe side, and that, in standing to the northward, Sun Corner must be kept well open of the Needles lighthouse—for these points touching is a scraping mark for the south-west prong of the Shingles—and not to cross the Bridge farther eastward than to have the north end of the trees at Hill farm touching, or in line with Warden point.

Working out on the ebb, when standing to the westward in the vicinity of the Elbow buoy, Hurst high lighthouse should not be brought within its own apparent breadth of the low lighthouse, as the ebb sets strongly over the Shingles. Perhaps it would be advisable, when abreast Hurst beach, to throw the vessel's head towards the island, and drop her out with the tide. At night, the ray of *white* light from the Needles lighthouse will be found a useful guide for tacking when standing to the eastward in the vicinity of Warden ledge; but in making the western board, as soon as the *red* light opens take care not to bring the Hurst lights in one—as they will be found to close rapidly on the ebb—in order to avoid the strong indraught of the North channel, as well as a highly dangerous approach to the Shingles.

At Night, the Needles channel may be considered safe with clear weather, a fair wind and moderate attention, recollecting after passing Anvil point light, in entering from the westward, that the southern limit of the Needles *white* light is E. ¼ N.; and that its northern limit bearing

E. by S. ¾ S. passes about 3 cables south of the shoalest part of the Dolphin bank and 1¼ cables south of the S.W. buoy of the Shingles.

A sailing vessel approaching from the westward, with the wind to the southward of West, and having crossed the northern limit of the *red* light, should steer in with the *white* light bearing E. by S. until the high light at Hurst bears N.E. by E. ½ E., when the S.W. buoy of the Shingles will be nearly in the same line, and the high light will be seen open a little to the northward of the low light. Keep the Hurst light in this position until the Needles *white* light bears E. by S. ½ S., or before it changes its colour to *red*, when edge *quickly* to the eastward to bring the Hurst lights in line, N.E. by E. ½ E.; then steer about E.N.E., and proceed up the channel with the high light a little open southward of the low light, which, as already observed, is necessary in passing the Elbow buoy. As the vessel nears Hurst take care to avoid the eddy tide on the flood off the point, and the indraught of the North channel on the ebb.

With the wind to the northward of West, a vessel may steer E. by S. ¾ S. near the northern edge of the *white* light, until the high light at Hurst bears E.N.E., then edge to the eastward to get the Hurst lights in line and proceed as before. So long as the depths are not less than 10 fathoms at low water, the vessel will be well to the southward of the Dolphin bank; but soon after the Hurst lights are brought to the northward of E. by N. ½ N., they will decrease from 9 to 7 fathoms, which will be a warning of a near approach to the entrance. When in the fairway the soundings may decrease to less than 5 fathoms, but as soon as they deepen to 10 fathoms, she will be well within the tail of the Shingles and the Bridge reef.

Approaching from the southward, steer in under easy sail with Hurst high light N.E. by E. ½ E., and the first cast under 10 fathoms will be a warning that the vessel is about one mile from the S.W. buoy. Keep the light on this bearing, the soundings gradually decreasing to 6 or 5 fathoms, until the Needles *white* light bears E. by S. ½ S., when edge *quickly* to the eastward to get the Hurst lights in line, N.E. by E. ¼ E.; and proceed as before.

Proceeding out of the Needles channel with the ebb, when abreast Hurst keep the *white* ray of the Needles light well in sight, S.W. by W. to avoid the indraught of the North channel, and the ledges on the island, side. When past Warden ledge the Needles *red* light may be opened a little, taking care to keep the high light at Hurst open southward of the low light until well below the Elbow buoy, or until the Needles light bears S.S.W., when Hurst lights may be brought in line. Directly the Needles light changes its colour from *red* to *white* the vessel will be clear of the Shingles, and if of large draught, should keep to the westward to avoid Bridge reef.

NORTH CHANNEL.—There are occasions when the passage by the North channel, between the Shingles and Hurst beach, will be found of great advantage particularly to steam vessels of moderate draught. It is also quite safe for any vessel not above 15 feet draught, provided the wind be free enough to allow her to shape a course by the marks; but as the channel is narrow and tides strong, vessels only of light draught should attempt to turn through,—and even then some practical knowledge is essential,—bearing in mind that the rise and fall is only from 5 to 7 feet and that the tide stands at the high level for two or three hours.

With North or N.E. winds a vessel with the ebb might work to the northward with great advantage at the back of the Shingles, observing, in standing eastward, not to bring Milford church to the northward of N.E. until Hurst point is seen coming on with Sconce point, when it will be quite safe to keep to the eastward, gradually bringing the low lighthouse a little to the northward of the south end of West hill trees E.S.E. (view C.), which will lead through the North channel in not less than 17 feet at low water. With this mark on, she may run close to the beach, which is steep-to, altering the course when necessary to keep about half-way between the N.E. buoy of the Shingles and Hurst point; with the flood she will be quickly carried past the point, but care should be taken to keep outside the eddy off Trap spit.

It would be useless attempting the North channel against the ebb, unless in a steam vessel, or with a fresh leading wind; if, however, it should be deemed practicable, take care that, in keeping close to the beach to cheat the tide, the vessel is not run upon the Trap.

SOLENT CHANNEL, comprised between Hurst point and the entrance of Southampton water, has no dangers in it but the Solent banks. Long mud flats, interrupted only by narrow creeks, leading into Lymington and Beaulieu rivers, run off the Northern shore, and several rocky ledges off the island shore.*

Hurst Road, on the north-east side of Hurst point, affording bad anchorage in easterly and south-east winds, is seldom used, in consequence of the uncertain eddies, which render it almost impossible to keep a clear anchor. Small vessels sometimes bring up, and a few of them can lie snugly out of the tide in a good depth of water over a clean bottom, at a moderate distance from the beach, but not nearer the mud than to have the middle Needles rock on with the eastern side of Hurst castle or just over the point.

Electric Telegraph.—An electric submarine cable is fixed about 400 yards westward of the west wing of Victoria fort on Sconce point;

* *See* Admiralty chart, the Solent, Hurst point to Cowes and Southampton Water, No. 2,040; scale, $m = 2\frac{3}{4}$ inches.

and thence it extends in a direct line across the Solent to the central towers of Hurst castle, and vessels are cautioned not to anchor on that line of direction, lest by doing so they damage the electric cable, or lose their anchors.

There is a telegraph station near Hurst castle, from which the arrival and departure of vessels off the Needles can be signalled to any of the places embraced by the Electric and International Company's systems, or to any place on the continent of Europe. Vessels can also have their numbers reported, or messages forwarded as they pass the Solent.

YARMOUTH ROAD.—The town of Yarmouth, at the mouth of the little river Yar, posesses a convenient port for small vessels, with an excellent quay, and valuable shelter is afforded by means of a substantial breakwater. From the end of Bank Street a wooden pier 12 feet wide, extends in a N. by E. ¼ E. direction, 712 feet. A signal station is established at Yarmouth. The village of Norton stands to the westward of the town.

The river Yar rises close to Freshwater Gate, and almost insulates the western extremity of the isle of Wight; it is navigable as high as the Freshwater mills. Two pilot boats and 16 small vessels belong to the port. A constant steam commuication is kept up with Lymington, Portsmouth, Cowes, Ryde, and Southampton.*

The road affords good shelter from all but easterly winds, especially those between E.S.E. and N.E., when it becomes much exposed. Vessels of moderate draught should anchor about one quarter of a mile from the shore in 7 fathoms, good holding ground, with the masts on Sconce point bearing W. by N., and Yarmouth church and castle masts in line S. ¼ W.; but if of large draught they should take up an outer berth in 8 or 9 fathoms, where the tide runs E.S.E. and W.N.W., about 2½ to 3 knots at springs. The sea is encroaching and washing away the coast line at the east end of Yarmouth.

LIGHTS.—Two *fixed* lights are exhibited at Yarmouth, the outer one *green*, from a lamp-post on the quay near the castle wall, and the inner one *white*, from the corner of a house. They are 30 yards apart, each 12 feet above high water, and when in line, S.S.W., lead into the harbour in 14 feet at high water springs. These two lights are only lighted during winter months.

A fixed red light is shown from the end of the pier.

Black Rock.—When running for Yarmouth roads from the westward, take care to avoid a dangerous ledge named Black rock, the greater part of which dries at low-water springs. It lies about one quarter of a mile westward of the anchorage, and as foul ground extends some distance outside

* *See* Admiralty plan, South Yarmouth, No. 1,784; scale, $m=20$ inches.

it, do not approach nearer than to have the conspicuous high tower of a house named the Towers or Refuge, open to the northward of the old castle at Yarmouth, S.E. ¼ S.

A red can buoy lies in 10½ fathoms, a little outside and to the northward of the rock, with the west end of Tapnel farm open of east end of Sand house at Yarmouth bridge, S. by E. ½ E.; the jetty at Sconce point W. ¼ S.; Lymington spit buoy N.N.E. ½ E. 1⅛ miles, and Hampstead ledge buoy E. ¼ N. about 3⅛ miles.

Fiddlers Race.—A short distance outside the Black rock there is a deep hole, which must be carefully avoided by boats when blowing hard during a weather tide, as it occasions a great overfall of the tide, and sometimes the sea is alarming. It is known to the local fishermen as the Fiddlers race.

LYMINGTON RIVER flows through the mud bank fronting the northern shore of the Solent opposite Yarmouth, and has on the western side of its entrance a can buoy, chequered red and white, placed in 12 feet on the spit which runs out a considerable distance, and is even nearer Yarmouth than the north shore, and by a large ball beacon known as Jack-in-the-basket. No stranger should attempt to enter the river without a pilot.

Entering the river at high water, keep Jack-in-the-basket in line with Lymington church, N.N.W. ½ W., until near the chequered red and white buoy, which may be passed pretty close, as well as the perches, all of which should be left on the port hand. Abreast the town there are 14 feet at high water springs, and 11 feet at neaps. The trade is mostly confined to coasting vessels.

Small vessels will find better anchorage and less tide in Lymington road than off Yarmouth. Anchor in 5 fathoms, over sand and mud, with Jack-in-the-basket in line with Lymington church, N.N.W. ½ W., and Hill trees on with Norton house, S.W. ¼ W. To avoid the Lymington banks at night, keep the Needles light shut in with Cliffs-end fort, or the high light at Hurst must not be brought to bear to the southward of W. ½ S.

NEWTOWN RIVER flows into the Solent 3½ miles eastward of Yarmouth, and about half a mile within its mouth divides into three creeks, the eastern of which leads up to the small village of Newtown, about one mile from the entrance. Spring tides rise here 2½ feet more than they do at Yarmouth. The Newtown gravel banks extend in some places about half a mile off the eastern side of the entrance, and are much in the way of small vessels when hugging the shore to keep out of the tide.

Solent Banks are formed by an accumulation of loose shingle, and lie in the fairway of the channel, about half way from Sconce point to Egypt point, near the spot where the first of the flood through the Needles

meets the last of the ebb. They are upwards of three quarters of a mile long, E. by N. and W. by S., and 2 cables wide; and having only 21 feet over their shoalest head, should be avoided by vessels of large draught at low water, From their shoalest head, the western edge of Hill farm trees is in line with Yarmouth sand-house, W. by S. $\frac{3}{4}$ S., and the coast-guard shed at Fish-house point is in line with the large chalk pit on the distant down S.S.E. The high lighthouse at Hurst bearing West will lead to the southward of these banks.

Hampstead ledge extends 2 cables in a north-west direction from Hampstead point, 3 miles eastward of Yarmouth.

A red can buoy is placed in 5 fathoms on its north-east end, distant one quarter of a mile from the shore, with the north-east end of trees on Hampstead point in line with the north-east end of Saltern park S.E. by E.; Egypt point, with Gurnard buoy nearly in line E. $\frac{1}{2}$ N.; Pitts Deep coast-guard houses N. by W. $\frac{1}{2}$ W.; and Salt Mead buoy East.

Salt Mead ledge.—Midway between Hampstead and Gurnard ledges, and nearly half-a-mile from the shore of Thorness wood, is Salt Mead ledge, a patch of foul ground with $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms, which is much in the way of small vessels when hugging the shore to keep out of the tide.

A red can buoy is placed in 5 fathoms on its north-east edge, with Egypt point bearing E. by N. (the Gurnard buoy appears a little outside the point); Luttrell tower a little within Stansore point, N.E. $\frac{1}{4}$ E.; Pitts deep coastguard houses, N.W. $\frac{1}{2}$ W.; Lepe Middle buoy, N.E. $1\frac{9}{10}$ miles; and Gurnard ledge buoy E. by N. 2 miles. The Mount trees at Yarmouth in one with Hill farm trees, W. by S., clears both this ledge and the gravel banks on the east side of the entrance of Newtown river.

Gurnard Ledges.—About $1\frac{1}{2}$ miles westward of Egypt point is Gurnard head, off which are a series of rocky ledges. Those that extend three-quarters of a mile eastward from the head, and nearly parallel to the shore, are named Gurnard ledges, and their eastern extreme is marked by a red can buoy moored 2 cables off shore, in 8 fathoms, with Gurnard bay coast-guard houses S.E. $\frac{3}{4}$ E.; Lepe Middle buoy N.W. by N. $1\frac{1}{10}$ miles; and West Bramble buoy N.E. by E. $\frac{3}{4}$ E. $2\frac{2}{10}$ miles. Egypt house open north of the old lime kiln, E. $\frac{1}{2}$ N. (View M.), leads outside the buoy, but will not clear the rocks to the eastward of it in Gurnard bay.

Lepe Middle, a shoal lying on the northern shore of the Solent off the entrance to Beaulieu river, projects about one mile from the shore, and lies well to the northward of the fairway course to and from Spithead; but being the turning point into Southampton water, it is marked by a conical buoy, with red and white vertical stripes, placed in 4 fathoms, with the inner beacon at Lepe, its apparent width east of the outer beacon,

N. by E. ½ E.; and the bathing house on Old Castle point open of Egypt point, E.S.E.; West Bramble buoy, East 2½ miles.

Luttrell tower, a conspicuous building between Stansore point and Calshot castle, kept open east of Stansore point, N.E. (View G), leads eastward of the buoy and over the eastern tail of the shoal in 4 fathoms; and Hill head coast-guard houses, midway between the large chalk pit and Nelson's monument on Portsdown hill, E. by N., leads south of the buoy and over the tail of the shoal in the same depth.

Beaulieu River.—The entrance, which is about three-quarters of a mile westward of Stansore point, has a mud bar, over which there are but 2 feet at low water springs, but there are depths of 4 and 5 fathoms within. The two red beacons standing on the shore close to the westward of the coast-guard buildings, when in one N. by E., show the deepest water over the bar, after which the channel is marked by perches. Springs rise 11½ feet at the entrance, and neaps 9½ feet. The springs rise 10 feet at Bucklers hard, 4 miles up the river, where in former years some frigates were built.

COWES ROAD and HARBOUR.—Three-quarters of a mile eastward of Egypt point is Cowes road, and the entrance of Cowes harbour, which is the principal port of the Isle of Wight, and the station of the Royal Yacht squadron. The town of Cowes stands on the East and West banks of the river Medina, which is navigable for vessels of light draught to Newport, the capital of the island. At the narrowest part of the river there is a floating bridge connecting East and West Cowes. Constant steam communication is kept up with Southampton and Portsmouth.

Cowes is a place of great resort for bathing and yachting, and has considerable trade. It is also noted for its ship-building yards and dry docks, the principal of which belong to Mr. John White. The largest dock, in which H.M.S. *Melville*, and several 74-gun ships have been repaired, is 330 feet long, 56 feet wide between gates, and has 16½ feet over sill at high-water springs; their other dock is 140 feet long, 36 feet wide between the gates, and has 12 feet over sill. They have also a patent slip, capable of taking up a ship of 500 tons burthen.*

Cowes Road is a safe anchorage, much frequented by yachts and merchant vessels waiting orders. The usual anchorage is in from 5 to 7 fathoms, with Cowes castle W. by S. ½ S., and the bathing house on Old Castle point, S.E. Pilots are always in attendance to conduct vessels into Cowes harbour or Southampton water, and strangers bound to these places would do well to avail themselves of their assistance.

For information as to prohibited anchorage in Cowes road and harbour, see Appendix, page 282.

* See Admiralty plan, Cowes harbour and river Medina, No. 2,793; scale, m=30 inches.

Prince Consort Shoal, composed of gravel and shells, is about 2 cables long, in a N.E. by E. and S.W. by W. direction, 60 or 70 yards broad, and has 20 to 28 feet water. Its shoalest part of 20 feet lies E.N.E. $3\frac{3}{4}$ cables from the Club house on West Cowes point. Norris castle vane in line with Old Castle point bathing house S.E. $\frac{3}{4}$ S., leads north-eastward of the shoal.

A red can buoy is moored in $5\frac{1}{2}$ fathoms off the north-east end of the shoal, about 63 yards from a depth of 24 feet, with the east end of Norris castle just open of the west end of Old castle point bathing house; the Club house tower, S.W. by W. $\frac{1}{2}$ W. $4\frac{3}{4}$ cables distant; and West Middle buoy, E. by S. $\frac{1}{2}$ S. $1\frac{1}{6}$ miles.*

Two black mooring buoys are laid down between the Prince Consort shoal and Old Castle point, for the use of Her Majesty's yachts.

Cowes harbour has from 9 to 14 feet in it at low water, and 21 to 26 feet at high water springs. The channel is marked on the east side by four chequered red and white buoys, and on the west by four red buoys. *See* Appendix, page 282.

The water flows into the harbour $7\frac{1}{4}$ hours, and ebbs about $4\frac{1}{2}$ hours; the tide runs with great strength.

TIDES in the SOLENT.—As before stated (page 152) the western stream through Spithead has great influence over the rise and fall of tide in the harbours of the Solent, and even to the westward. With spring tides there are two high waters on the shore in Cowes harbour. On full and change days, the first high water is at 10h. 45m.; the tide then falls one or two inches, and again rises two or three inches and makes a second high water at 11h. 45m.; the tide then falls till low water, which is at about 4 h. During neaps there is only one high water. Springs rise $12\frac{1}{2}$ feet, neaps $9\frac{1}{2}$ feet.

It is high water, full and change, at Yarmouth, at 10h., and again at 12h., and low water at 3h. 30m.; springs rise 7 feet, and neaps 6 feet. In Lymington river it is high water at 10h. 25m., and again at 0h. 15m.; and low water at 4h.; springs rise 8 feet, and neaps $6\frac{1}{2}$ feet. At Calshot castle it is high water at 11h. 30m., and low water at 4h.; springs rise 13 feet, and neaps $9\frac{1}{2}$ feet.

At 10h. the tide slacks at the Needles, at which time it is also high water at Yarmouth. The tide there then falls from four to six inches, but in half an hour, or at 10h. 30m., the western stream has acquired strength in the Solent, by which the water is again accumulated, and rises to its former level, thus making a second high water at about noon. An uniform fall or

* This shoal was discovered in 1864 by H.M.S. *Prince Consort* tailing on it while at anchor. In 1876 the buoy was moored 150 fathoms N.N.E. of its former position in consequence of the shoal having extended.

ebb then takes place until low water at 3h. 30m., about the same time as the stream slacks near the shore.

There is a considerable difference in the rise and fall of tide at Yarmouth and Lepe; a spring tide falls about 2½ feet lower, and rises about 2½ feet higher at Lepe and at Cowes than it does either at Yarmouth or Hurst.

At the Solent banks the stream turns to the westward at 9h. 30m., and to the eastward at 4h., and the greatest velocity of both streams is 3½ to 4 knots. Near Calshot light-vessel the streams are rotary, and turn nearly at the same time as at Spithead. To the westward of the Bramble in the fairway, the flood makes about 1¾ hours, and the ebb 1½ hours later than at Spithead.

In Cowes road the eastern stream makes at 3h. 30m., the western at 9h. 50m.; velocity 3 to 3½ knots.

DIRECTIONS.—There are no dangers in the fairway of the Solent but the Solent banks, and as no clearing marks, intelligible to a stranger, can be given, vessels of large draught had better pass between them and the island shore.

To avoid the long mud flats which extend off the northern shore of the Solent, do not bring the high lighthouse at Hurst to the southward of W. ½ S. until abreast Egypt point, nor come into less than 6 or 7 fathoms at low water.

Hill farm trees on with the east end of the north side of Yarmouth, and well open northward of the Mount trees at the east end of Yarmouth, bearing W. by S., leads in the fairway from off Hampstead point to Egypt point.

A safe rule for vessels turning to windward along the southern shore from Hampstead to Egypt point, is to keep a good half mile off shore and not go into less than 8 or 7 fathoms water. Egypt point is bold on its northern face, and may be passed at the distance of about 1¼ cables.

At night the light shown in the eastern face of the high lighthouse at Hurst kept on a West bearing will lead a quarter of a mile south of the Solent banks (5 miles from Hurst), and thence steer E. ¾ N. to abreast Egypt point. When Calshot light bears N.E. the vessel will be a little westward of Cowes road, in which she may safely anchor for the night; or if intending to proceed on to Spithead, the course will be S.E. by E. to pass between the Ryde Middle and the Mother bank, until the light on Ryde pier bears S.S.E.; the vessel will then be eastward of the east buoy of the Middle, when it will be necessary to steer E.S.E. to give the Sturbridge a good berth and to reach the anchorage.

BRAMBLE BANK is a vast accumulation of sand and gravel which nearly blocks up the entrance of Southampton water; a small part near the west end has been heaped up into a knoll, which dries at low tide.

There are 3 fathoms water along the southern edge of the bank, 8 fathoms at the distance of 2 cables, and 11 and 12 fathoms between it and Cowes road.

Four buoys mark the Bramble bank, viz., the West Bramble buoy, conical and chequered red and white with staff and cage, which lies in 4½ fathoms at the south-western extremity of the shoal, with Lepe Middle buoy W. ¼ S. 2½ miles; and Prince Consort buoy, on the south side of the channel South, three-quarters of a mile.

N.W. Bramble Buoy, can, red, in 25 feet, lies N.N.E. four-tenths of a mile from the West Bramble buoy.

Hill head or N.E. Bramble Buoy, conical and red, lies in 3 fathoms, on the north-east side of the Bramble shoal, with the N.W. Bramble buoy W. by S. $1\frac{4}{10}$ miles; Calshot light-vessel N.N.W. ¼ W. seven-tenths of a mile and on the line between the East Bramble buoy and Calshot castle.

East Bramble Buoy, conical with red and white vertical stripes, lies in 19 feet, with West Bramble buoy W. by N. ¼ N. 2½ miles; West Middle buoy W. by S. ½ S. $1\frac{3}{10}$ miles; and N.E. Middle buoy S.E. by S. $1\frac{7}{10}$ miles.

CALSHOT SPIT is an extensive shoal running off Calshot castle, which stands on the extreme of the low, long, and shingly point, at the western side of entrance to Southampton water.

CALSHOT SPIT LIGHT-VESSEL is moored in 4 fathoms, on the south-eastern spit of the shoal, one mile S. by E. from the castle, and nearly two-thirds of a mile W.S.W. from Calshot light-vessel. The vessel has two masts, with a conical cage at each masthead, and exhibits two *fixed* lights, *red* over *white*. A bell is sounded in foggy weather.

In the event of any accident to this vessel necessitating its removal for repairs, it is intended to place temporarily on the site of the light-vessel the refuge bell buoy which was formerly moored there.

There is a black and white chequered buoy marking the eastern edge Calshot spit at nearly 4 cables S.E. ¾ S. from the castle.

THORN KNOLL, upwards of half a mile long, with 2½ fathoms water, occupies a mid-channel position between Calshot spit and the north-west side of the Bramble bank, having a channel on either side leading to Southampton water, the one to the northward being the broader and deeper. This danger is marked by two can buoys.

Thorn Knoll Buoy, painted with red and white horizontal stripes, in 4½ fathoms on its west end, and distant three-tenths of a mile N.W. of the N.W. Bramble buoy.

The North Thorn Buoy, red, on its north end, lies in 3½ fathoms, with Calshot castle bearing North, Calshot spit refuge buoy N.E. ¼ N. 3½ cables, Calshot light-vessel N.E. by E. one mile, and Thorn Knoll buoy S.W. by W. ½ W. half a mile.

CALSHOT LIGHT-VESSEL, moored within the Bramble shoal in 3½ fathoms, S.E. 1¼ miles from Calshot castle, exhibits at 31 feet above the sea a white light, which *revolves every minute*, and should be visible in clear weather from a distance of 9 miles. The vessel is painted red, with the word *Calshot* on her sides; and carries a ball at the mast-head. A gong is sounded in foggy weather, and a gun fired if a vessel be seen standing into danger.*

Shoal.—In the fairway of the entrance to Southampton water, nearly midway between Calshot light-vessel and Calshot castle, there is a small patch of 22 feet, gravel and mud, with Calshot light-vessel bearing S.E. distant 6 cables, Calshot castle coast-guard flagstaff N.W. ¼ N., Luttrell tower W. ⅝ S.

SOUTHAMPTON WATER forms one of the finest harbours in the kingdom, being quite landlocked, and its approaches so protected that no sea of any consequence can rise. From Calshot castle to the town of Southampton the deep-water space embraces a channel 5 miles long and half a mile wide, between banks of soft mud which cover at high water. For 3½ miles of this distance the channel carries 5 to 9 fathoms at low water, but at 1½ miles below the town, in mid-channel, between Hythe and Netley abbey, is Netley shoal, with only 2 fathoms on it; there is, however, a 4-fathom channel on the western side of this shoal, and a 3-fathom channel on the eastern side; and thence to the bar, which has 2 fathoms on it, the depths are 4 to 5 fathoms. Above the bar, abreast the town, there is a narrow space, about half a mile long, with 3 to 3½ fathoms in it.

Shoal near Coastguard Moorings.—A shoal having a depth of 18 feet is situated near the moorings of the coast guard ship, with Netley hospital dome bearing E. by S. ½ S., distant 8 cables, Netley castle flagstaff N.E. by N. 7 cables, Hythe church N.W. by W. ⅔ W. $1\frac{3}{10}$ miles; coast-guard ship's mooring buoy S.E. by E., 217 yards.

The edge of the mud bank bordering the western side of Southampton water is marked by black and white chequered buoys, and that on the eastern side by red buoys. The mud bank on the western side between Calshot and Hythe is steep-to, suddenly breaking down from a high bank to 7 and 8 fathoms water. On the eastern side, at 2 miles within the light-vessel, is the entrance of the river Hamble, which is navigable for small

* For light-vessels' riding lights and signals, *see* page 26.

vessels for about 3 miles up to Bursledon bridge, where there are 6 feet at low water, and the rise of tide nearly the same as at Calshot point. A spit runs out nearly one mile from the north entrance point, and its extreme is marked by a red buoy; the village of Hamble is about half a mile above this point. At one mile above the village is the magnificent structure known as the Royal Victoria military hospital; and about one mile nearer Southampton the fine old ruin of Netley abbey.

The town of Southampton stands at the confluence of the rivers Test and Itchen, and since the introduction of steam and railways it has become the principal foreign packet station in the kingdom. The docks are built upon a large scale on the south side of the town, and comprise a tidal basin—the entrance to which is on the west side of the Itchen—a floating dock, and three dry docks which open out of the basin. The tidal basin comprises an extent of 16 acres, with an entrance 150 feet wide, and carries a depth of 31 feet at high water springs, 27 feet at high water neaps, and 18 feet at low water springs. It has a quay frontage of 3,300 feet, surrounded by extensive bonded warehouses, vaults, sheds, and cellars, and is supplied with numerous cranes, and a powerful pair of sheers tested to the weight of 100 tons.

The floating dock is 10 acres in area, 770 feet in length, 550 feet in breadth, 56 feet wide at entrance, with 30 feet water in it, and 29 feet over sill at high-water springs, and 25 feet at high-water neaps. The dry docks are respectively 450, 425, 395, and 251 feet on blocks; 56, 80, 66, and 51 feet wide between gates; and have 25, 25, 21, and 15 feet over blocks at high-water springs.

The docks are surrounded by quays measuring 5,000 and 6,000 feet. Ships can enter the docks at all times of tide for general business or for repairs. An extension of the London and South-western railway is carried into the docks, so that goods and passengers can be conveyed to London within three hours.

To the west of the docks are situated the town quays and Royal pier. The tonnage dues payable by vessels entering the port entitle each vessel to a berth at the town quay to discharge or load. The town quays are capable of accommodating vessels up to 1,000 tons (net register). They have 25 feet of water, and are well provided with conveniences for unloading, storing, or dispatching cargo.

The breadth of the anchorage off the town is about one cable, which increases to $1\frac{3}{4}$ cables lower down, and is defined by four conical buoys painted red and marked *Anchorage, S.W.;* the depth is from $2\frac{1}{2}$ to $3\frac{1}{2}$ fathoms at low water. The channel from the mouth of the Itchen to the entrance of the tidal basin is widened and deepened to 16 feet at low-water springs. The channel up the river Test above Southampton is marked by buoys and booms. A large proportion of the timber from the

New Forest is exported from Redbridge, a village at the head of Southampton water, where there are several shipbuilding yards, and a manufactory for linseed oil and cake.

LIGHTS.—A fixed *green* light is shown from the end of Netley pier.

Two fixed *red* lights vertical, 12 feet apart, are shown at the north-east end of Hythe pier.

Two *fixed* lights, red over white, 12 feet apart, are exhibited by a light-vessel (the *Harpy*) moored on the west side of Itchen river entrance.

Two *fixed* lights are exhibited on the dock pier heads, *dark red* on the northern pier, and *red* on the southern pier; when in line bearing N.N.E. ⅜ E. they lead up the Itchen, which is buoyed and beaconed on the east side, to the entrance of the docks.

Two fixed *green* lights, placed vertically, mark the end of the extension quay on the north-west side of the Itchen.

One fixed *green* light is shown from the centre of the south end of the town quay extension; and on the Royal pier-head is shown a fixed *red* light. Vessels after passing 1½ cables to the south-west of the *Harpy* light-vessel should keep the red light on the Royal pier westward of the green light (town quay extension) which will lead up the fairway to the town quay.

TIDES.—There is a double high water at Southampton, the knowledge of which is most important. The first high water on full and change days is at 10h. 30 m., the second high water at 0h. 45 m., and low water at 4h. 0m.; springs rise 13 feet, neaps 9½ feet. At Marchwood magazine, springs rise 12 feet, neaps 9½ feet. At Redbridge it is high water 12 minutes later than at Southampton, and low water at 3h., or one hour sooner; springs rise 8½ feet, neaps 6 feet.

The double high water at Southampton is probably caused by the tide from Spithead, for so long as it runs strong to the westward, the water is kept up at Southampton, and there is no fall of consequence until the tide begins to slack at Spithead; but when the tide makes to the eastward at Spithead, the water falls rapidly at Southampton (*see* page 151).

After low water the tide rises pretty steadily for about 6½ hours, which may be considered as the first or proper high water; it then ebbs for an hour about 9 inches, at the end of which time it again commences to rise, and in about 1¼ hours reaches its former level, and sometimes higher; this is called the second high water, being something more than 2 hours after the first. To the mariner, the knowledge that the high water remains stationary for rather more than 2 hours may, in some cases, be very important.

The ebb continues 3¼ hours, and falls most rapidly 2 hours after the second high water, at which time the stream runs strongest in the fairway.

At neaps, although the tide stands for a considerable time near high water, there is no observable difference in the level.

There is a marked difference in the set of the tide, and in the time of its turning on the opposite sides of the entrance of Southampton water: for example, near Hill head on the eastern side, the eastern stream makes at 2h., and the western stream at 9h. 15m., running rather more than 7 hours one way, and 5 hours the other, as it does at Spithead; whereas on the opposite shore the time of turning is at 3h. 45m. and 10h. 30m.

The Bramble has a considerable influence in diverting the tide and increasing its rate. The last 2 hours of ebb, the stream splits near Calshot, one part running to the westward, and the other to the eastward, scooping out in their progress the two channels, one on each side of the shoal.

DIRECTIONS.—There are two channels leading into Southampton water, one, with 14 feet in it at low-water springs, on the eastern side of the Bramble, and the other, with 5 to 10 fathoms in it, on the north-west side of that shoal; the latter is the main channel, but it is considerably narrowed by the Thorn knoll, with only 2½ fathoms on it, which for vessels of large draught makes it somewhat intricate. The channel eastward of the Bramble can only be used by vessels of moderate draught, except at high water, when those drawing 22 or even 23 feet may avail themselves of it.

To enter by the western channel, having arrived between the Lepe Middle and Egypt point, steer for Calshot light-vessel on a N.E. by E. ¾ E. bearing—the light-vessel will then appear midway between the black refuge buoy on Calshot spit and the red buoy on the north end of the Thorn knoll; and when about 2 cables westward of the light-vessel, or when Calshot castle bears N.W. by N., a course of about N. by W. ¾ W.—avoiding the 22-feet patch lying N.W. 6 cables from Calshot light-vessel—will lead towards Southampton, keeping in mid-channel and leaving the black and white chequered buoys on the port hand, and the red buoys on the starboard.

If entering by the eastern channel, pass one cable eastward of the east Bramble buoy, then steer N.W. ¾ N. for Calshot castle, this will lead close to Hill head or N.E. Bramble buoy; when Calshot light-vessel bears N.E. by E. ¾ E., or when midway between it and the spit refuge buoy, proceed for Southampton as before.

At Night.—Having passed through the Needles channel, the white light in the high lighthouse at Hurst kept West will lead in mid-channel up the Solent, until Calshot light bears N.E. by E. ¾ E., which bearing must be maintained with great precision in order to pass between Thorn knoll and Calshot spit. Calshot light, kept on a general bearing, S.S.E. ¼ E.,

will lead towards Southampton; but as the tide runs strong, it need scarcely be observed that a stranger should not attempt this navigation at night without a pilot.

The two *red* lights on the dock pier heads kept in one, N.N.E. $\frac{3}{5}$ E., lead up the river Itchen to the entrance of the docks. The two white lights on the Royal pier in one, lead up to the pier end.

OLD CASTLE POINT.—On the eastern side of the entrance to Cowes harbour is an extensive high bank of mud named the Shrape, which at Old Castle point dries upwards of half a cable from the shore; and as the water is shoal for some distance outside this, the locality is marked by a red can buoy, which lies in 3 fathoms, with the Bathing house on Old Castle point S.W. $\frac{1}{2}$ S. about 2 cables; Prince Consort buoy, N.W. by W. seven-tenths of a mile; and West Middle buoy, E. by N. $\frac{1}{2}$ N. six-tenths of a mile. The depth is only 2 fathoms at the distance of 130 feet within the buoy.

RYDE MIDDLE SHOAL, lying between Cowes road and Stokes bay, and marked by three buoys, is a long narrow bank of mud, gravel, sand, and shells. Its western extreme is nearly three-quarters of a mile from the red buoy off Old Castle point; and thence it extends in a S.E. by E. direction for upwards of 2 miles, parallel with the Mother bank. The least water on the shoal is $1\frac{3}{4}$ fathoms, about two-thirds of a mile from its western end, and there are 6 fathoms near on either side.* The shoal is marked by three buoys.

West Middle (can) buoy, red and white horizontal stripes, is moored in 28 feet, close to the westward of a 15-feet patch; with Ashey Down tower bearing S. $\frac{3}{4}$ E., and the Club house at West Cowes point, West.

S.E. Middle (conical) buoy, chequered red and white, is moored in 7 fathoms; with Coastguard flagstaff (westward of Mansion house hotel) touching the south tangent of Southsea castle E. by S.; the semaphore in Portsmouth dockyard in line with second chimney from the eastward of the Coastguard houses in Stokes bay E. $\frac{3}{4}$ N.; Wootton rocks (Isle of Wight) S. by W. $\frac{3}{4}$ W.

N.E. Middle (conical) buoy, red, with staff and globe, is moored in $7\frac{1}{2}$ fathoms; with Southsea castle light-tower just open north of Gilkicker fort, E. by S. $\frac{1}{4}$ S.; Coastguard flagstaff at Lee point N.N.E. $\frac{1}{4}$ E.; the semaphore in Portsmouth dockyard in line with the second chimney from the eastward of the Coastguard houses in Stokes bay E. $\frac{3}{4}$ N.

STURBRIDGE SHOAL, with 16 feet water, midway between Ryde and Gilkicker point, is narrow, composed of sand, and three-quarters

* *See* Admiralty chart, Spithead and approaches from the eastward, No. 2,050; scale, $m = 2{\cdot}75$ inches.

of a mile long in a S.E. ½ E. direction. Each extreme is marked by a buoy, painted with black and white horizontal stripes.

Buoys.—The western (can) buoy lies in 5 fathoms, with No-man's land fort S.E. ½ E.; and outer end of Ryde pier S.W. ¼ S. The eastern (conical) buoy lies in 5 fathoms, with Spit fort N.E. by E. ¾ E.; No-man's Land fort S.E. ¼ E.; and outer Spit buoy E. ¼ N. 1⅔ miles.

PEEL AND MOTHER BANKS, extending across the bight between East Cowes and Ryde, extend 4½ miles in a S.E. by E. direction from Old Castle point, and terminate to the eastward in an inner and an outer spit. The Inner spit lies between Sturbridge shoal and Ryde sand, but the eastern edge of the Outer or Mother bank spit in 3 fathoms lies two-thirds of a mile W. by N. ¾ N. from the western extremity of Sturbridge shoal, with Kickergill tower in line with the western edge of the large chalk pit on Portsdown hill N.E.

The depths on these banks vary from 1½ to 2½ fathoms at low water, with 5 fathoms on their outer edge, which—abreast Wootton creek—is 1¼ miles off shore, and there are 7 to 10 fathoms between the outer and inner spits of the Mother bank and the Sturbridge.

Buoy.—Peel bank (can) buoy is red, and lies in 5 fathoms, on the northern edge of the Peel bank, abreast King's Quay creek and about one mile off shore, with S.E. Middle buoy N.E. by E. ½ E. three-quarters of a mile; and Ashey Down tower S. ¼ W.

The QUARANTINE GROUND is to the N.N.W. of the town of Ryde, and its limits are marked by two yellow buoys on the northern edge, and by three lazaretto hulks on the southern. The deep water is near the lazaretto hulks, where there are 4 fathoms. Merchant vessels in pratique generally anchor between the Outer and Inner spits of the Mother bank, and the Sturbridge in from 5 to 11 fathoms, over good ground, and sheltered from southerly winds, with Ryde bearing from S.W. to S.S.W.

Quarantine Buoy, No. 1.—A yellow can buoy is moored in 5 fathoms on the northern edge of the Mother bank spit, with the following marks and bearings; south side of fort Monkton touching the north side of the round tower at Point, Portsmouth, E.N.E.; Nelson's monument about half-way between the beacons placed for marking the west end of the measured mile in Stokes bay, N.E. by N.; centre of Ryde pier head South one mile distant.

Quarantine Buoy, No. 2.—A yellow can buoy is moored in 5 fathoms on the north-east projection of the Mother bank, with Southsea castle lighthouse in line with the north-west corner of Eastney water tower, E. ¼ S.; Ashey down monument in line with the centre of a roof of

a house among trees, S. by W. ½ W.; centre of Ryde pier head S.S.E. ½ E. 1½ miles distant.

A red buoy, moored in the centre of the quarantine ground, marks the quarantine burial place.

The Peel buoy, the Quarantine buoys, and West Sturbridge buoy are nearly in a line.

RYDE.—From Cowes the shore trends in a south-easterly direction 7½ miles to Nettlestone point, and is fronted by sands and shallow banks. At the distance of 1½ miles the two lofty towers of the Royal residence at Osborne are visible above the trees, and at 5½ miles is the town of Ryde with its two piers. The western pier, 2,400 feet long and 22 feet wide projects in a northerley direction from the town, and at the pier head there are about 7 feet at low-water springs.

The eastern pier, 1,200 feet long and 30 feet wide, runs off from the town about 200 yards eastward of the new pier and in the same direction. On the shore between the piers is the entrance to tidal basin, 220 feet long, 110 feet wide, with 8½ feet in it at high-water springs, and 5½ feet at neaps. At the head of the tidal basin is a floating basin, 250 feet long, 20 feet wide at entrance, with 8 feet over sill at high-water springs, and 5 feet at neaps.

For information on the prohibited anchorage off Ryde pier, *see* Appendix, p. 282.

Light.—A *fixed* white light, elevated 21 feet above high water, and visible at about 6 miles, is shown from the end of the western pier.

Tides.—It is high water, full and change, at Ryde Pier, at 11h. 20m. and low water at 4h. 15m.; springs rise 13½ feet, neaps 10 feet.

STOKES BAY PIER and LIGHTS.—A pier, 700 feet long and 60 feet broad, runs off from the shores of this bay, about half a mile northward of Gilkicker point. The pier-head, which is the terminus of the South-western railway, is so constructed as to present three faces for steam vessels to go alongside; those facing the north-west and south-east are each 120 feet long, and the outer, or that facing the south-west, is 110 feet, having 8 feet alongside it at low-water ordinary spring tides. This pier and the new pier at Ryde are in conjunction with the South-western railway.

A *fixed red* light is shown at each end of the outer or South-west face of the pier. And when steam vessels are expected other red lights are shown, one at the north-west angle of the pier, and one at the south-east angle of the pier.

Beacon buoys for measured mile.—Two beacon buoys, painted white, with red staff and ball, are moored off Stokes bay, for the

purpose of indicating the course of the measured mile for testing the speed of Her Majesty's ships. The eastern buoy lies in 13 fathoms, half a mile to the southward of Gilkicker point; and the western buoy lies in 10 fathoms, three-quarters of a mile to the southward of Brown Down batteries.

The buoys lie N.W. and S.E. of each other, and are placed one cable from either end of the measured mile, the limits of which are shown by beacons on shore. As the course between the buoys is not more than $1\frac{1}{2}$ cables outside a bank in Stokes bay, on which there are only $3\frac{3}{4}$ and 4 fathoms, ships of heavy draught should not turn inwards, or towards the shore of the bay.

DIRECTIONS.—Vessels proceeding from the Solent towards Spithead may pass south of the Ryde Middle, between it and the Mother bank. If intending to take this channel, having passed through Cowes road, and between the red buoy off Old Castle point and the west buoy of the Middle, steer so as to bring Egypt point *just* opening of Old Castle point, W.N.W. nearly, and these marks on astern will lead to the anchorage at Spithead.

There is an equally good channel north of Ryde Middle between it and the Bramble, the leading mark through being the tower of Southsea castle, well open north of fort Monkton E. by S. $\frac{3}{4}$ S.; or Spit fort, its breadth open south of Gilkicker fort S.E. by E. $\frac{3}{4}$ E.; and when the north-east buoy of the Middle bears S.S.E., steer S.E. $\frac{1}{2}$ E. for Spithead. The former mark continued will lead to the anchorage in Stokes bay, which is often resorted to by small vessels in strong northerly winds; vessels of large draught will pass outside the banks in this bay by keeping Calshot castle open south of Calshot light-vessel.

In proceeding westward from the anchorage at Spithead, and intending to go north of the Middle, steer about N.W. into Stokes bay until Spit fort is its own breadth open south of Gilkicker fort S.E. by E. $\frac{3}{4}$ E.; and with this mark on, proceed between the Middle and Bramble shoals until abreast Old Castle point, when the course to Hurst will be about W. $\frac{1}{2}$ S., and the distance $11\frac{1}{2}$ miles.

If intending to go south of the Middle, steer to the westward until Egypt point is just open of Old Castle point bearing W.N.W. nearly; taking care, however, when nearing the south-east buoy of the Middle not to keep Egypt point too much open of Old Castle point, for fear of getting too near that shoal. When the west buoy of the Middle bears about N.N.W. steer N.W. or more northerly, to avoid the ledge off Old Castle point and Prince Consort shoal, till Egypt point bears W. by S., and then steer West till abreast of the point.

A vessel of large draught turning to windward to the northward of the Middle may stand towards the Sturbridge shoal and Gilkicker point to

10 fathoms at low water, both being very steep-to, the Mother bank to 7 fathoms, Stokes bay to 9 or 8 fathoms, the Middle to 7 fathoms, and towards the shore to the same depth; but no nearer the Bramble than 9 fathoms, nor Old Castle or Egypt point than 8 fathoms. Working to the southward of the Middle, stand no nearer the Mother and Middle banks than the depth of 7 fathoms. Between Egypt point and Yarmouth the island may be approached to 8 or 7 fathoms, and the main to 7 or 6 fathoms.

SOUTH COAST OF THE ISLE OF WIGHT.

Aspect of Coast.—St. Catherine lighthouse bears S.E. 12¼ miles from the Needles lighthouse, the land gradually ascending to the point and beyond it as far as Dunnose, the south-east point of the island, above which St. Boniface down rises 770 feet above the level of high-water springs; and thence it declines towards Culver cliff, the eastern end of which, being of chalk, may be easily recognised from the marked contrast between it and the land in its vicinity. From the pitch of this cliff, 213 feet high, the land gradually rises to the crest of Bembridge down. on which stands a fort. Yarborough monument, a conspicuous object from seaward, stands on Culver down, 312 feet above high water.

From Culver cliff the land gradually decreases in height, until it terminates in Bembridge point, which is low. Midway between the cliff and the point is a place named Black rock, where the coast-guard watch-house, a conspicuous white cottage, stands on the edge of the bank, 89 feet above high water. As Bembridge point is approached, Foreland farm will be observed, which is a useful and well-known sea-mark.

Freshwater Bay.—From the Needles the range of high and precipitous chalk cliffs continue on to the middle of Freshwater bay, where they are lower, and about 1½ miles beyond merge into a shore of clay and sand. On the highest part of the cliffs, 490 feet above high water, is Nodes beacon. Freshwater bay is between the Needles and Brook point, and on its shore, at the head of a small cove about 3 miles from the Needles, is a watering place named Freshwater gate. On the west side of the cove is a small fort, cut out of the chalk cliff.

Brook and Atherfield Ledges.—Off Brook point are the remains of fossil trees, and to the eastward a small cove and landing-place off the chine, near which is Brook village. Steep clay cliffs of moderate and nearly equal height extend from Brook to beyond Atherfield point, and there are several beautiful chines and villages, at the back of which are high and extensive downs. About 1½ miles from St. Catherine point the land begins to rise; and one mile westward of the point is Blackgang

chine, between which and Atherfield point is Chale bay, the scene of so many fatal wrecks.

The whole of this part of the coast is fronted by dangerous ledges, which in some places extend nearly one mile from the shore. The principal are Brook and Atherfield ledges; but there are also sunken rocks, of which St. Andrew and Chale rocks are the most off-lying. This part of the coast should be most cautiously approached, especially in thick weather and during the flood, as that stream sets directly towards them (*see* page 150).

Landing Places.—There is a landing-place at Chilton chine, and on each side of Atherfield point; and there is another at Puckaster cove, about one mile eastward of St. Catherine point.

Life Boats.—A life boat is established at Brook and Brixton chines, between Freshwater bay and St. Catherine point.

ST. CATHERINE POINT, the southern extremity of the Isle of Wight, is a low rounded point at the foot of St. Catherine hill, and the stone lighthouse marking the point stands out boldly when viewed from eastward or westward. The hill, which is the highest part of the island, rises to the height of 804 feet above high water, about one mile northward of the point, and on its summit are the remains of the old lighthouse, and an old tower.

A low cliff extends along the shore between St. Catherine point and Dunnose, and at its back are large masses of rock, named the Undercliff, which is again backed by a wall of precipitous rock nearly 500 feet above the sea, with downs rising still higher behind. Steep-hill castle, with the villas and church at Ventnor, are conspicuous objects when sailing along this part of the coast, which may be approached to half a mile, as the rocks bordering it do not extend off above half that distance.

Close to the westward of St. Catherine point, between it and Rocken end, is a rocky ledge with 3 to 6 fathoms on it, which extends more than half a mile from the coast, and close to the shore are the Jeremy and Shag rocks. At 1½ miles W. ¼ N. from St. Catherine point is a rocky patch of 9 fathoms, with deep water around it.

To the eastward of St. Catherine point is St. Catherine deep, with 37 and 39 fathoms water, rocky bottom, which extends parallel with and about one mile from the shore abreast the Undercliff. It is several miles long and from half a mile to one mile broad, with a general depth outside of 11 and 12 fathoms, rocky bottom. Near its east end, and more than 4 miles S.E. ½ S. from Dunnose is a rocky patch of 10 fathoms, with 25 to 35 fathoms between it and the land.

LIGHT.—The lighthouse on St. Catherine point is an octagonal stone embattled building 54 feet high, and from it, at an elevation of 134 feet above high water, is exhibited a *fixed* white Light of the first order, which should be visible in clear weather from a distance of 17 miles. The light is visible between the bearings of S.E. ½ E. and W. ½ N.

Fog Horn.—In foggy weather a powerful fog horn is sounded from St. Catherine lighthouse. The mouth of the horn is at an elevation of 81 feet above high water, traverses an arc of 215 degrees, namely, from E. ¾ S. round by south to N.W., and gives *two blasts* in quick succession every four minutes.

Signals.—A signal station (Lloyd's) is established at St. Catherine point for reporting all vessels that show their numbers by Commercial code of signals, and, if necessary, to forward advices.

SANDOWN BAY.—Between Dunnose and Culver cliff is Sandown bay, in which are the villages of Shanklin and Sandown. The steep cliffs continue on from Dunnose towards Sandown, where they decrease in height, and the shore is low and sandy; they then gradually rise to Culver cliff, close to the westward of which is a cliff of red clay, which contrasts strongly with the chalk of Culver cliff.

The water is shallow for some distance off the shore of Sandown bay; but the lead will be a good guide when standing in. A shoal with 24 to 28 feet (low-water ordinary spring tides) on a chalk bottom, and 6 to 8 fathoms around, extends nearly 3 cables in a N.W. by W. and S.E. by E. direction, with a breadth of half a cable; its western extreme, on which there is the shoalest water (24 feet), lies with Culver cliff bearing N.E. by E. ½ E., distant $1\frac{2}{10}$ miles, and Sandown fort N.W. by N. The shoulder of Appuldercomb hill in line with Shanklin railway station bearing W. ⅛ N. leads a quarter of a mile seaward of this shoal.*

In Sandown bay there is also a rocky patch of 9½ and 10 fathoms at 4½ miles E. ½ S. from Dunnose.

WHITE CLIFF BAY.—Culver spit, carrying 4½ fathoms water over rocky bottom, extends nearly 1½ miles south-east from Culver cliff, and within it, close to the eastward of the cliff, is White Cliff bay, where a limited extent of clear ground affords tolerable shelter out of the stream, with the wind off-shore, for small vessels waiting tide. The east pitch of the cliff, W. ½ N., and the coast-guard watch-house N. by E., will place a vessel half a mile off shore in 2½ fathoms water. A small reef, the outer

* This shoal was found by H.M. surveying vessel *Porcupine* on re-sounding Sandown bay, in connexion with the operations for raising the wreck of H.M.S. *Eurydice*, which ship foundered in a squall in March 1878.

part of which dries at low tide, extends nearly one-eighth of a mile from the base of Culver cliff; and a large rock, named the Shag, which covers only at high-water springs, lies at the point of the cliff.

White Cliff bay terminates at Black rock, and thence to Bembridge point the coast is fringed by one unbroken rocky shelf, uncovering at low water to the extent of nearly one-third of a mile from the shore. These rocks are high and steep-to at their outer edge, and over many parts there are not more than 3 or 4 feet at high-water springs; outside their edge the depth increases to 2 fathoms, which depth will be found throughout at the distance of half a cable. Within their margin, just inside the point named Sharpus, on a small sandy patch which dries at low water, the fishermen find a valuable shelter for their small boats during the fishing season.

TIDAL STREAMS.—It is high water, full and change, at Atherfield point, at 10h. 20m., and low water at 3h. 40m.; springs rise 8½ feet, neaps 7 feet. In Freshwater bay, about one mile S.W. of Brook point, and the same distance off Atherfield point, the western stream makes at 10h. 35m., and runs at the rate of one knot, and the eastern stream at 2h. 35m., from 2 to 2¾ knots; both streams take the direction of the coast. About 4½ miles W. by S. from St. Catherine point the western stream makes at 11h. 0m., setting N.W. ¾ W., and the eastern stream at 5h. 0m., in the opposite direction, the rate of both being from 2 to 4 knots; but one mile W. by S. from the point the streams set N.W. by N. and S.E. by S., 3 to 4 knots, and two-thirds of a mile S.S.W. of the point W. by N. and E. by S. with the same velocity.

After rounding St. Catherine point the seaman must be on his guard at night against the indraught on the flood, which will be found more or less when navigating between the Isle of Wight and the Owers.

Nearly 5 miles S.S.E. of Dunnose, at full and change, the streams turn at 10h. 40m. and 4h. 30m., and set E. ½ S. and W. by N.; velocity, from 4 to 5 knots at springs, and 3 knots at neaps; but S.E., 2 miles from Dunnose, the flood sets E. by N., and the ebb W. by S., and the turn of both streams is rather earlier. At one mile S.E. of Dunnose the flood sets N.E. by E., or towards the Princessa shoal.

DIRECTIONS.—Between the Needles and St. Catherine point the shore must be approached with caution, particularly on the flood, as that stream sets directly towards the many treacherous ledges stretching out a considerably distance, particularly those off Brook and Atherfield points. The highest of the chalk cliffs on the east side of Freshwater bay on with Brook point, N.N.W. ¼ W., or a remarkable white road running over the down in line with Blackwood point (View P) will lead outside the Ship and Atherfield ledges, and also of the St. Andrew and Chale rocks to the south-

east. A safe mark for small vessels working up in-shore, is to keep the three Needles rocks open of Sun corner, or the Priory church at Christchurch open of the Needles lighthouse N.W. ½ N.; with the Needles lighthouse only open of Sun Corner a vessel would run upon the Atherfield ledges. At night a vessel of large draught should on no account lose sight of the Needles *red* light, which will be on a N.W. ¼ N. bearing, nor stand into a less depth than 15 or 16 fathoms at low water.

A good precaution is to keep the Needles light N.W. by N. until St. Catherine light bears N.E., when a vessel may safely haul to the eastward until the Nab light is sighted, the bearing of which will be a guide for clearing the Princessa shoal and for the eastern entrance to Spithead (*see* page 200).

The overfalls off St. Catherine point and Dunnose are partly caused by the various sudden transitions from deep to shoal water in that neighbourhood; but they are not dangerous, except in bad weather, when no open boats should attempt to pass through either. The race off St. Catherine point varies in proportion as the wind is with or against the tide. In gales from the westward, and during spring-tides, the sea breaks to the south-east of the point as violently as in the race of Portland.

EASTERN ENTRANCE TO SPITHEAD.*

The eastern passage into Spithead is between the Dean and Horse sands and the several shoals which lie off the eastern end of the Isle of Wight. The principal dangers on the island side are the Princessa, Bembridge, Nab, Warner, No-man's Land, &c.†

PRINCESSA SHOAL, marked by two buoys, is an extensive and irregular patch of foul ground, the middle of which bears from Culver cliff E.S.E. about 2 miles. The shoal is nearly 1¼ miles long E. by S. and W. by N., and near its western end rather more than a half a mile broad. The water over it varies from 3¼ to 4 fathoms, the shallowest part being near the north-western edge, where there is a ridge one quarter of a mile in length East and West, with as little as 19 feet over it at low water; but as there are several shoal heads of 22 to 24 feet on the shoal, vessels of large draught should be cautious how they cross any part of it.

N.W. or Inner Buoy, can shaped, and painted with black and white vertical stripes, lies in 32 feet, close to the north-western edge of the shoal, and from it Culver cliff bears W. by N.; Nettlestone point just shut

* *See* Admiralty chart, Spithead, and approaches from the eastward, No. 2,050; scale, $m = 2 \cdot 75$ inches.

† The principal shoals were re-sounded by Staff-Captain J. Parsons, H.M. surveying vessel *Porcupine*, 1879–81.

in by Bembridge point; and Bembridge ledge buoy N.N.E. nearly one mile.

S.E. Buoy, conical, with staff and cage, is chequered black and white, and lies in 29 feet, on the eastern edge of the shoal, with St. Helen's sea-mark in line with the north-east extreme of the cliff near the entrance of Brading haven N.W. ¾ N.; Culver cliff W. by N. ¼ N.; N.W. Princessa buoy W. by N. ½ N. a mile nearly; and Nab light-vessel N.E. ½ E. 2½ miles.

Clearing Marks.—The northern sharp shoulder of Appuldercomb hill in line with Shanklin railway station West (View Q) leads south of the Princessa; the spire of Bembridge church on with Foreland farm N.W. (View R) leads north; and Bembridge fort, its apparent breadth inside Nettlestone point N.N.W. ½ W., clears the eastern side. The red clay cliff in Sandown bay kept open south of Culver cliff, W.N.W., will also lead south of the shoal; and it will be avoided at night or in thick weather by not standing into less than 10 fathoms at low water.*

BEMBRIDGE LEDGE, extending three-quarters of a mile off Bembridge point, has only 18 feet over its outer edge. A considerable part of this ledge dries at half tide, and terminates in a high sharp point named Sharpus, about one third of a mile off shore, in a S.E. by E. direction, rather more southerly that the main body of the shoal; there are not more than 5 feet over its outer extremity, even at high-water springs.

Buoy.— A chequered black and white (can) buoy marks the outer edge of Bembridge ledge in 4 fathoms, with Bembridge church N.W. by W. ½ W.; centre of Horse fort on with centre of Southwick fort on Portsdown hill N. ¾ E.; Warner light vessel N. ½ E. 2⅔ miles; and Nab light-vessel E. ¾ N. 2½ miles.

Marks.—Bembridge mill on with the highest part of Brading down W. by N. ¼ N.; and the Dock mill at Southsea, on with the large chalk-pit on Portsdown hill N. ¾ E., will serve as close marks for the edge of the shoal in 4 fathoms should the buoy be removed.

A Life Boat is stationed at Bembridge.

Cole Rock and Dawe Banks are two dangerous patches on the northern part of Bembridge ledge, which small vessels should approach with great caution. The north-western patch, Cole rock, shows itself at spring tides, and dries in several heads in a north-west and south-east direction for more than one cable. From the centre of the rock St. Helen's church is just open of St. Helen's sea mark—a stone structure erected on the shore one quarter of a mile S.S.W. of St. Helen's point—bearing N.W., and

* *See* views on Admiralty chart, Owers to Christchurch, No. 2,045; scale, $m = 1{\cdot}4$ inches.

the face of Culver cliff is just within Bembridge point, between Foreland farm and Foreland village S.W. by W. ½ W.

The south-eastern patches, the Dawe banks, form an irregular-shaped shoal about one third of the distance from the Cole rock to Bembridge ledge buoy. It never dries, but there are not more than 8 feet water over its shoalest part.

St. Helen's church open one quarter of a point northward of the Sea mark, N.W. ½ W., leads north of both patches; and Black rock watch-house in line with north end of chalk pit on Culver Down, W. by S., leads to the southward. These will be sound useful marks for small vessels; for although the latter may be considered as leading full close, they may by not exceeding it be sure of carrying a depth of 2 fathoms at low water. When northward of Cole rock, or when Culver cliff is well open north of Foreland farm, St. Helen's church should be open more of the Sea mark, to insure clearing the tail of the shoal, which extends some distance northward of the rock.

Nab Rock.—Although the water deepens suddenly into 6 or 7 fathoms to the eastward of Bembridge ledge, the rocks soon rise again and extend off a considerable distance, under the general name of the Nab shoal, the body of which is about one mile long north-west and south-east, and one quarter of a mile broad, with numerous shoal spots of 25 to 27 feet water.

The small head, known as Nab rock, near the centre of the shoal, has only 24 feet over it at low water, and is marked on its west side by a can buoy, with black and white horizontal bands, in 4¾ fathoms, with Ashey Down tower open north of the boat house at Lane End W. by N. ½ N.; east end of Eastney barracks, in line with east end of Widley fort on Portsdown hill, N. by E.; Bembridge ledge buoy, W. by S. seven-tenths of a mile; Warner light-vessel N. by W. $2\frac{6}{10}$ miles; Nab light-vessel E. ¾ N. $1\frac{8}{10}$ miles; and Princessa S.E. buoy S. ½ W. $1\frac{3}{10}$ miles.

NAB LIGHT-VESSEL, moored in 5¼ fathoms, exhibits two *fixed* white lights on masts 54 feet apart; the light on the mainmast is 38 feet, and that on the foremast 28 feet above the sea, and they should be visible in clear weather from the respective distances of 8 and 6 miles. The vessel is painted red, with the word *Nab* on her sides, and carries a ball at each mast head; a gun is fired if a vessel be seen standing into danger, and a gong sounded in foggy weather.*

The marks for the vessel are Portsmouth church tower in line with Southsea castle lighthouse N.N.W.; Kickergill tower in line with east end of fort Monkton N.N.W. ¾ W.; North tower of Osborne just open of east-

* For light-vessels' riding lights and signals, see page 26.

ernmost trees near Ryde N.W. by W.; Warner light-vessel N.W. 3¼ miles; and Dean Tail buoy N.N.E. ¾ E. one mile.

Outer Nab Rock is a small patch of foul ground 1½ miles S.W. ¾ S. from the Nab light-vessel, and, as there are only 4½ fathoms on its shoalest part, it should be avoided by vessels of large draught. Bembridge mill on with the north-east end of Foreland village W.N.W. points to the 4½ fathoms; but on with the south-west end of the village N.W. by W. ¾ W. leads to the southward of the patch; whilst Bembridge church on with Lane End farm N.W. by W. ½ W. leads to the northward. The barracks, or the coast-guard houses on the brow of the bank at Sandown, in line with Culver cliff W. ⅛ N., leads well to the northward, and also midway between it and the Nab shoal, where the depths are 5 and 6 fathoms.

New Grounds are several shoal spots of gravel, sand, and broken shells lying within the Nab light-vessel to the westward, and which have possibly been heaped up by the Spithead tide meeting the tide round Dunnose somewhere near this spot.

The New Grounds are dangerous for vessels of heavy draught after half ebb with any sea on, as there is as little as 4½ fathoms over the shoalest part, which lies W. by N. ½ N. a little over one mile from the Nab light-vessel. As the ground in this locality is very irregular, with many patches of 5 fathoms and less, it would be advisable to bear in mind when piloting large ships that all these detached patches are comprised within the following limits, viz., the northern sharp shoulder of Appuldercomb hill in line with Shanklin railway-station West; and the Nab light-vessel N. by E. ½ E.

Long Rock is the name given to a considerable extent of foul ground extending to the north-east from the coast north of Bembridge point, and lying to the north-west of the Nab shoal, on which there are several heads of 23 to 25 feet of water. On the shoalest head of 23 feet, Culver cliff is seen nearly half a point open northward of Lane End farm; and the south-east end of St. Helen's water-mill—a white building on the north side of Brading haven—is in line with the north end of the Ferry house, which stands on the shingle point on the same side at the entrance.

ST. HELEN'S ROAD, off the east end of the Isle of Wight, is well sheltered from all but south-east winds, with excellent holding ground of mud and stiff blue clay, and calculated for vessels of any draught. The best position for heavy ships is in 7 or 8 fathoms, with Ashey Down tower in line with Bembridge fort W. ¼ N., or St. Helen's sea mark just open to the southward of Bembridge fort; and the spire of St. Jude's church, Southsea, just open west of Horse fort N. ¼ E.; but smaller vessels may

anchor further in with the former marks on, according to draught of water.

DIRECTIONS.—For ships of moderate draught there is a clear and safe channel, half a mile wide, between the N.W. buoy of the Princessa and the shore, and between the Bembridge ledge and Nab rock buoys, which may prove useful in fine weather and with leading winds to vessels intending to anchor in St. Helen's road; but under no circumstances should ships attempt to work through, for no good turning marks can be given, and as the tides are strong, if caught with light and baffling winds near Bembridge ledge, they would be in some danger, particularly as the western stream, when free from the influence of the channel, has a strong tendency to set over that shoal.

As from the offing the saving of distance by this channel to St. Helen's road would scarcely be appreciable, it is not recommended save in cases of necessity, more especially as the course through the channel inside the Princessa is dependent on a single bearing of the Nab light-vessel; and as her position may possibly be affected by heavy gales, ships might unconsciously be led into danger.

In the event, however, of circumstances rendering such a step advisable, bring the Nab light-vessel E. by N. $\frac{3}{4}$ N., which will lead over Culver spit in $4\frac{3}{4}$ fathoms, and through the channel in from 5 to 6 fathoms, and when St. Jude's church, Southsea, just opens east of Horse fort N. $\frac{1}{8}$ E. steer for these objects, or for the Warner light-vessel bearing N. $\frac{1}{4}$ W.; either of these should lead through in about mid-channel, between Bembridge ledge and the Nab rock, the least water to be crossed being $4\frac{1}{2}$ fathoms. When Ashey Down tower comes in line with Bembridge fort W. $\frac{1}{4}$ N., or St. Helen's sea mark is just open to the southward of the fort, a vessel may anchor in St. Helen's road as already directed, or proceed on for Spithead, rounding the Warner light-vessel on her eastern side, and then with the leading marks on, viz., Kickergill tower in line with the centre of fort Monkton N.N.W. $\frac{1}{2}$ W., select a convenient anchorage.

This channel should not be attempted at night; but if circumstances render such a step unavoidable, bring the Nab lights E. by N. $\frac{3}{4}$ N., and steer for them on that bearing, until the Warner light bears N. $\frac{1}{4}$ W., when steer for her, and either anchor in St. Helen's road when the *green* light on Bembridge fort bears W. $\frac{1}{4}$ N., or proceed on for Spithead, rounding the Warner light-vessel on its eastern side.

Vessels of heavy draught intending to anchor in St. Helen's road, after rounding the Nab light-vessel at a moderate distance on her eastern side, should steer for Horse fort until Bembridge fort bears W. by N. $\frac{1}{2}$ N., and then alter course to W.N.W., making allowance for tide; by following the

above directions a depth of not less than 5 fathoms at low water will be preserved, and anchorage can be obtained in 7 or 8 fathoms, as previously directed.

Vessels of large draught beating into St. Helen's road should not stand farther southward than to have Foreland farm on with the eastern chalk-pit on Bembridge down, which clears the Nab shoal and New grounds, but to avoid the 4¾-fathoms patch between the latter and Long rock, the chalk-pit should not be brought farther than Lane End farm. In making the northern board do not stand farther than to have the summit of Brading down in line with St. Helen's sea mark, which clears St. Helen's patch.

When turning into the road at night, and having the Nab lights to the southward of E.S.E., a vessel should, when standing to the eastward, tack as soon as the Warner light bears N.W. by W., which will be a sufficient warning of her approach to the Dean Tail. In standing to the westward, the Warner light N. ½ E. is quite far enough.

BRADING HAVEN offers no refuge except for vessels of small draught, although at high-water springs it assumes rather an imposing appearance. From the shingle points at the entrance the sands dry at the lowest tides to a considerable distance out. The bank on the south side of entrance is of sand and gravel, and extends nearly three quarters of a mile in a north-easterly direction; its highest part, which is near the edge of the channel, has only 6 feet over it at high water, and is marked by five fragile beacons to be left on the port hand in entering; the outer beacon, which is abreast the bar, is surmounted by a basket. The bank on the northern side, from the base of St. Helen's sea mark, uncovers for about half a mile, and is thickly interspersed with large stones and masses of rock; on the outer end is a small beacon buoy, which must be left on the starboard hand in entering.

Abreast the outer beacon is a bar of sand, gravel, and stones, which dries across, the water leaving it half an hour before the tide has ceased falling by the shore, being about one foot above the low-water level; 12 or 13 feet may, however, be carried over it at high-water springs. The channel is very narrow, and not even navigable for boats at low tide. Within the high-water points a few small vessels of 5 or 6 feet draught may lie afloat in a small hole on the southern side. When the tide is out the Haven is little more than an extensive bank of bare mud, with a few patches of sand and gravel, carrying a depth over most of them of not more than 3 or 4 feet at high-water springs, and remaining uncovered at neaps.

BEMBRIDGE FORT and LIGHT.—At the north-east extremity of the bank extending off the south point of Brading Haven is

Vessels are recommended not to pass within the space marked by these buoys, for although no danger is to be apprehended from explosions—as the buoys used in torpedo experiments are not loaded—yet inconvenience would arise from fouling the electric cables attached thereto, and boats and lightly built vessels striking violently against either the torpedo buoys, or current closers, which would sometimes be under water, might receive damage in consequence.

RYDE SAND.—From Nettlestone point the sands uncover at low-water springs for nearly 1½ miles, in a northerly direction to the Sand-head, and thence turn away W. by N. towards the outer end of Ryde pier.

A chequered black and white (can) buoy is placed off the Sand-head in 28 feet, with Kickergill tower in line with the centre of the new fort on Gilkicker point North; outer end of Ryde pier, in line with flagstaff on Wooton point, W. ¾ N.; East Sturbridge buoy, N. by W. ½ W. half a mile; and No-man's Land fort, S.E. by E. ¼ E. 1⅛ miles.

The approach to this extensive flat, named Ryde Sand, should be made with caution, as its outer edge is steep-to, and although vessels may safely stand towards it into 10 fathoms water, they must on no account pass to the southward of the buoy. Quarr house in line with the end of Ryde pier, W. ¼ N., just clears the northern edge of the sand.

HORSE and DEAN SAND.—This extensive shoal, to the existence of which the invaluable roadstead of Spithead is mainly indebted for shelter from the violent effects of S.E. gales, is composed of coarse sand mixed with gravel and broken shells. It is quite a flat, having but little water over any part of it; from 6 to 9 feet may be taken as an average depth over the shoalest parts, and were it not for the four black buoys and fort, which mark its outer edge, it would be dangerous to approach; but in daylight, with anything like clear weather, it is impossible to err with the most ordinary attention, although it is necessary to bear in mind that the outer edge in some parts is steep-to, particularly between Horse fort and Horse Elbow buoys.

From Southsea castle, marking the eastern side of the entrance to Portsmouth harbour, the Horse and Dean commences, its direction being about S. ½ W. for nearly 2 miles, where the Horse fort is erected near the edge of the bank, which is here very steep.

From the Horse fort the shoal trends rather abruptly to the S.S.E. and at the distance of nearly three-quarters of a mile is Horse Elbow buoy, which with the Warner light-vessel marks the narrowest part of the channel into Spithead. Here also the bank is steep-to, the buoy lying in 5 fathoms within one cable of the depth of 10 fathoms.

From the Horse Elbow buoy the shoal alters its direction to about S.E., and continues straight for 2 miles, when it gradually disappears. This part of the bank is known as the Horse Tail, and the three buoys which mark its edge are named the Dean buoys.

Horse Fort Light.—The fort already alluded to as marking the steep north-west ledge of the Horse sand, is distant rather more than one mile from No-man's Land fort on the opposite side of the channel, and both are serviceable in marking its limits. From the Horse fort, at an elevation of 34 feet above high water, is exhibited a *fixed* red light.

Dean Tail Buoy, conical and black with staff and ball, is the south-easternmost buoy on this side of the channel, and lies in 5 fathoms, just outside the depth of 4 fathoms, with Ashey Down tower in line with south side of Bembridge fort, W. ¼ N.; the east end of Blockhouse fort just open west of Southsea castle point, N.N.W. ¾ W.; the Nab light-vessel S.W. ¾ S. 1¼ miles; the Warner light-vessel N.W. by W. ¾ W. 3 miles, and Dean Elbow buoy N.W. by W. 1¼ miles.

Dean Elbow Buoy, can and black, lies in 5 fathoms, with south side of No-man's Land fort, in line with Old Castle point, N.W. by W. ¼ W.; the water tower at Eastney barracks in line with east end of Southwick fort on Portsdown hill N. ½ W.; Nab light-vessel S. ¾ E. $1\frac{7}{10}$ miles, and Dean buoy N.W. ½ W. 1¼ miles.

Dean Buoy, can and black, lies in 6 fathoms about one cable from the edge of the shoal, with the water tower at Eastney barracks in line with west end of Widley fort on Portsdown hill N. by E.; Upton mill, near Ryde, on with the upper corner of a triangular field near Nettlestone point, W. ¼ N.; Warner light-vessel W. ¾ S.; and Horse Elbow buoy N.W. six-tenths of a mile.

Horse Elbow Buoy, can and black, is in 5 fathoms, with Kickergill tower in line with the north-east end of fort Monkton N.N.W. ¾ W.

Ashey Down tower, just open south of the houses on Nettletone point, W. by S. ½ S.; Warner light-vessel S.S.W. ¾ W., two thirds of a mile; and Horse fort N. by W., two-thirds of a mile.

Outer Spit Buoy marks the outer end of the Spits and extending in a general S.S.E. direction from the shore between Blockhouse and Gilkicker points, and forming the western boundary of the channel into Portsmouth harbour. The buoy, conical, and chequered black and white, lies in 3½ fathoms, with the eastern side of No-man's Land fort, in line with Yarborough monument on Culver down S.S.W. ¼ W.; fort Monkton mast in line with tower of Bay house N.W. ½ N.; Spit Refuge buoy N. by E. ¾ E.

half a mile; Gilkicker point N.W. ¼ W.; *and Horse fort* S.S.E. ¼ E. *one mile.*

Spit Refuge Buoy, with bell, is chequered black and white, and *lies in 22 feet at the extremity of the Spit sand, with east Swashway beacon,* half-way between St. Paul's church, and the west end of large chalk-pit on Portsdown hill N. by E. ½ E.; Gilkicker point in line with the *south side of the Spit fort,* N.W. by W. ¾ W.

There is about the same depth of water, viz., from 20 to 23 feet, over the bank between this buoy and the Outer Spit buoy, but ships of heavy draught, on entering or leaving Portsmouth harbour, should, unless near high water, pass to the southward and eastward of the Outer Spit buoy.

Boyne Buoy, nun and green, lies 170 feet W. ¾ N. of the wreck of the *Boyne* in 30 feet, and serves to mark the western edge of the Horse sand. From it the east end of Fort Monkton is in line with the south side of Spit fort N.W. ¾ W.; and the Dock mill is in line with the London road over Portsdown Hill, N.E. by N. The buoy should always be passed on its western side. There is only 19 feet water on the wreck.

SPITHEAD ANCHORAGE.—The limits of the best anchorage at Spithead are, Southsea castle from N.E. to E. by N., and Gilkicker point from N.N.W. to N.W. A good berth for large ships is in from 10 to 12 fathoms, with Kickergill tower on with the red and white mile mark on the western end of fort Monkton N.N.W.; and the lighthouse in Southsea castle on with north end of Spit fort N.E. by E. ¼ E.; but vessels of moderate draught may berth themselves near the Spit sand, in about 7 fathoms, taking care not to open Kickergill tower to the eastward of the east end of Fort Monkton barracks.

At Night.—A good berth is in from 8 to 12 fathoms with Warner light bearing S.S.E., and the *green* light in Southsea castle bearing N.E. ½ E.; or otherwise as most convenient. Southsea castle light will change from *red* to *green* when it bears N.N.E. ¾ E.

Torpedo Ground.—Three buoys, painted green and white in horizontal bands, and marked *Torpedo Ground,* mark the limits within which torpedo experiments are made, near Gilkicker point. These buoys are permanent.

No. 1. West Buoy, in 11½ fathoms. The Inner west beacon of the measured mile in line with the coastguard flagstaff at Stokes bay N. by W., and the whole of Lumps fort in sight south of Southsea castle E. ½ S. No. 2. Middle Buoy, a *conical* buoy in 8 fathoms. North side of Southsea

Assembly Rooms in line with the north angle of Pier Hotel E.N.E., the flagstaff on the west end of fort Monkton in line with the inner east beacon of the measured mile N. ½ W., and the west buoy W. by N. ¾ N. No. 3. East buoy, in 3 fathoms. North corner of the old gun wharf, seen south of Blockhouse fort N.E. ¼ N., Lumps fort just showing to the southward of Southsea castle E. ¾ S., the middle buoy W.S.W., and the east end of the stone wall running from the east side of fort Monkton N. ¾ W.

Mariners are recommended not to pass within the space marked by these buoys, for, although no danger is to be apprehended from explosions—as the buoys used in torpedo experiments are not loaded—yet inconvenience would arise from fouling the electric cables attached thereto, and boats and lightly built vessels striking violently against either the torpedo buoys or current closers, which would sometimes be under water, might receive damage in consequence.

DIRECTIONS.—From the Westward.—From about one mile off Dunnose to the same distance south of the S.E. Princessa buoy the course and distance will be E. by N. ¼ N. 6¾ miles, varying according to the direction of the wind and set of the tide. The Princessa will be avoided by keeping the red clay cliff, next westward of Culver cliff, open to the southward of the latter; or the sharp northern shoulder of Appuldercomb hill in line with Shanklin railway station, West, until abreast of the S.E. buoy of Princessa.

About half a mile outside the Princessa depths of 7 to 8 fathoms at low water will be maintained, the nature of the bottom being changeable, but generally gravel and broken shells, interspersed with numerous patches of foul ground. Nearly abreast the Nab, and thence to the New Grounds, less water may be expected, and even an occasional cast of as little as 5 fathoms, but almost invariably gravel and broken shells.

After rounding the S.E. Princessa buoy, the vessel, if of moderate draught, may haul to the northward, and steer about mid-channel between Bembridge ledge and Nab rock, with St. Jude's Church, Southsea, just open east of Horse fort bearing North, or for the Warner light-vessel bearing N. ¼ W., the least water in this route being 4½ fathoms; the above marks will lead to the eastward of the Warner light-vessel, up to the line of the leading mark into Spithead, which is Kickergill tower on with the middle of fort Monkton barracks, bearing N.N.W. ½ W. After passing No-man's Land and Horse forts, a suitable berth for anchorage may be selected according to circumstances.

There is an available channel for small vessels between Nettlestone point and the Warner shoal, the leading mark for which is Kickergill tower, on

with No-man's Land fort N. by W. ½ W., which will lead through from seaward, east of the Princessa shoal, inside the Nab rock, and Warner, until Spit fort and the round tower at Portsmouth point are in line N. ½ E. These latter marks will lead into fairway channel to Spithead; but it should be observed that the space half a mile south-eastward of No-man's Land fort is used for torpedo experiments during certain seasons, *see* page 193. The least water in the above route will be 3½ fathoms inside the Warner shoal.

In ships of large draught, from a position about one mile to the southward of the S.E. Princessa buoy, a course should be steered to the northward and eastward not passing to the northward of the Princessa clearing mark, viz., the sharp northern shoulder of Appuldercomb hill in line with Shanklin railway station West—until Nab light-vessel bears N. by E., when steer for her; by doing so all the shoal patches of 5 fathoms and under in the vicinity of the Outer Nab will be avoided. After passing about one cable east of the light-vessel, steer for Warner light-vessel about N.W. ¼ N., until Kickergill tower comes on with the middle of fort Monkton N.N.W. ½ W., when proceed with these marks on, and select an anchorage at Spithead.

When approaching the Nab light-vessel at low-water springs, during bad weather, and with a heavy sea, it might be necessary to modify the above directions for ships of very heavy draught, and approach the light-vessel from a more easterly direction, in order to preserve a depth of not less than 6 fathoms water. To do so, it will be necessary to pass two-thirds of a mile to the south-eastward of the Nab light-vessel, and then steer to the northward towards Dean Tail buoy, until Warner light-vessel bears N.W. ½ W., when proceed for her on that bearing, until the leading marks through to Spithead come in line.

From the Eastward.—The Nab light-vessel lies N.W. ¾ W. $12\frac{3}{10}$ miles from the Owers light-vessel, the Boulder buoy being nearly midway and on nearly the same line of bearing: therefore the course to be steered for the Nab light-vessel will be dependent on the distance the vessel passes outside the Owers light-vessel. On approaching the Nab light-vessel, a ship of moderate draught might bring Kickergill tower on with the middle of fort Monkton, N.N.W. ½ W. and proceed with these leading marks through to Spithead; but ships of heavy draught should pursue the route recommended to the eastward of the Nab light-vessel.

As it not unfrequently happens that Kickergill tower and fort Monkton are difficult to identify from haze, or are partially hidden by shipping at Spithead, it would be well to bear in mind that Spit fort just open east of Horse fort N.N.W. will lead vessels of even large draught in safety

to a mid-channel position, between the Dean and Dean Elbow buoys, whence there will be no difficulty in picking up the leading marks for proceeding to Spithead. In this route the least water will be 5¼ fathoms.

When turning to windward ships may stand between Dean Tail and Dean buoys into 8 fathoms at low water; but between Dean buoy and Horse fort the sand is steep-to, and should not be approached into a less depth than 15 fathoms. Horse and No-man's Land forts are of great service, when working in, standing as they do near the edges of their respective shoals, but a strict attention to the lead is necessary.

Beating through St. Helen's road, if the vessel is of large draught do not stand farther to the southward than to have Foreland farm on with the eastern chalk pit on Bembridge down; this will clear the Nab shoal and New Grounds, but to avoid the 4¾ fathoms patch, between the latter and Long rock, the chalk-pit should not be brought farther than Lane End farm. In making the northern board do not stand farther than to have the summit of Brading down on with St. Helen's sea mark, which clears St. Helen's patch.

Kickergill tower on with the west end of the barracks in fort Monkton will lead outside the Warner, and the same tower turned from end to end of the barracks in the fort will clear the shoals on both sides; but a vessel of large draught must not bring the tower to the extreme end of the barracks, which would be attended with danger, but should tack when it is twice its own breadth within the end until she is at least 2 cables to the northward of the Warner light-vessel, when the tower may safely be brought on with the west end of the barracks, taking care that the soundings are not shoaled to less than 15 fathoms at low water, which will be a good and safe guide until past No-man's Land fort. The tides must be strictly attended to when turning to windward near the shoals.

Although 15 fathoms is a good guide for a vessel working between the Warner and No-man's land, and abreast of these shoals nothing less is safe, yet having passed westward of the No-man's Land fort, she may safely stand into 12 fathoms, which will be found a safe depth the whole way up to the east end of the Sturbridge.

As the tide runs with considerable strength at springs through the channel into Spithead, vessels of small draught will find it frequently to their advantage to run over the Horse sand, and not confine themselves to the fairway; but when this is done, the rise of tide should be carefully considered. From half flood to half ebb a vessel not exceeding 12 feet draught may borrow on the Horse sand as long as Blockhouse fort is open of Southsea castle; and if under 9 feet draught she may do so from a quarter flood to three-quarters ebb, as the shoalest water outside of this line at springs is about 7 feet.

At NIGHT, if in vessels of moderate draught, from abreast Dunnose, steer to the eastward with St. Catherine light just open of the land, bearing about W. by N. until the Nab lights bear N.E. ½ N.; or being about one mile off Dunnose, an E. by N. ¼ N. course will lead about the same distance outside the Princessa shoal, taking care not to stand into less than 10 fathoms at low water until the Nab lights bear N.E. ½ N., they should then be steered for on that bearing, until Warner light bears N.N.W., when alter course for it. After rounding Warner light-vessel at a convenient distance on its eastern side, proceed in mid-channel about N.N.W. between the lights on Horse and No-man's Land forts, and anchor at Spithead in from 8 to 12 fathoms, with Warner light S. by E. ½ E., and the *green* light in Southsea castle N.E. ½ E., or otherwise as most convenient.

The above route will skirt the Outer Nab rock, but even supposing that patch be crossed, the least water will be 4½ fathoms.

When Southsea castle light is first seen, bearing N. ¾ E., it will appear *red;* the vessel will then be to the westward of the Horse sand, and have the harbour channel open. The line of bearing on which the light changes from *red* to *green* is N.N.E. ¾ E.

In ships of heavy draught from a position off Dunnose with St. Catherine light just in sight W. by N., and the Nab lights N.E., steer N.E. by E. ½ E. until the Nab lights bear N. by E., when steer for them on that bearing; by doing so all the shoal patches of 5 fathoms and under in the vicinity of the outer Nab will be avoided. After rounding the light-vessel at a convenient distance on its eastern side, steer for Warner light on a N.W. bearing, and when Spit fort light opens out west of Horse fort light, a N.N.W. ½ W. course will lead between the lights on Horse and No-man's Land forts, and through to Spithead.

PORTSMOUTH HARBOUR.—The land between Gilkicker point and Selsea bill is low and broken by a deep inlet in which are the islands of Portsea, Hayling, and Thorney, and the harbours of Portsmouth, Langston, and Chichester. Portsmouth, the westernmost of these harbours, is connected with that of Langston by Hilsea channel which separates the north end of Portsea island from the main, and is crossed by an iron draw-bridge. There is also a passage from Langston into Chichester harbour by north Hayling channel, which separates the north end of Hayling island from the main, and is crossed by a swing bridge connected with each shore by a causeway; the swing bridge is 23 feet wide, and there are 12 feet in the channel at high-water springs.

The approach to Portsmouth harbour is defended by Gilkicker, Monkton, and Blockhouse forts on the west, and Southsea castle, built on the south extreme of Portsea island, on the east. At one mile within the castle, is the

entrance of the harbour, 750 feet wide at high water, between Blockhouse fort on the west and the Round tower on the east. Within the entrance the harbour widens out, and takes a N. by E. direction for nearly 1½ miles. when it merges into the Fareham and Porchester lakes, off which branch several smaller lakes. These lakes are bordered by mud banks, which are covered at high tide, the whole space to the northward of the dockyard forming then an expanse of water 2½ miles long north and south, and the same east and west.

The general width of the channel within the harbour is about 2 cables and the depths in it irregular, from 8 to 3 fathoms; it is, however, considerably narrowed by the Ballast and Burrow banks, which project from the western shore. The Ballast bank begins just within Blockhouse point and extends N.N.E. upwards of one quarter of a mile, its northern end being nearly half way across the channel. It is about 400 feet broad, and the least water on it, 8 feet, is near its south-west end; there are 16 feet on its eastern side, which has been lately dredged. The Burrow bank, composed of mud and stones, extends from the mud off Burrow island half way across to the north-west angle of the dockyard. It is 2½ cables long, 2 cables wide, and has as little as 6 feet on it at low water. On this bank considerable dredging has been going on.

Fareham lake is about 1¾ cables wide at entrance at low water; it then gradually narrows, the depths being from 4½ to 3 fathoms for three-quarters of a mile to abreast of Bomb Ketch and Spider lakes; at one mile farther on the depth is only 1½ fathoms. The lake then bends to the W.N.W., and becomes narrow and shoal, there being only one foot at low water at half a mile below Fareham. Porchester lake has irregular depths in it, from 5 to 3 fathoms, decreasing to 6 feet just below Porchester castle. Its direction is north and north-east for about 2½ miles when it bends to the south-east and soon becomes a mere drain.

The town of Portsmouth stands on the eastern side of the entrance of the harbour, and on its north end stands the town of Portsea, the Mill-dam creek that formerly divided them is now filled in, and the fortifications that enclosed their eastern sides are all in process of demolition. On the west sides of these towns, and occupying the whole extent of the eastern shore of the harbour are, the Town cambers, the Gun wharf, and Her Majesty's dockyard.

The western side of the harbour is fronted at low water by a mud flat, through which flow two narrow creeks named Haslar and Weevil lakes. Occupying the whole extent of shore between the lakes is the town of Gosport, and north of it the Royal Clarence victualling yard, both enclosed on their western sides by ramparts and a deep moat. Weevil lake enters the harbour in front of the victualling yard, and a depth of 5 feet may be carried up to Her Majesty's landing pier at low water. On the

north shore of this lake is the magazine, which is fortified on its land side; two piers run off, one from the east side of the magazine into the harbour, and the other from the south side into the lake. About half a mile south-west of Gosport, and separated from it by Haslar lake, is Haslar hospital, a brick building covering a large extent of ground between Blockhouse and Monkton forts. Gosport is connected with Point at Portsmouth by a steam bridge, and with Haslar by a bridge over Haslar lake.

The Town cambers are between Point at Portsmouth, and the new Gun wharf; they both dry out at low water, and are separated by a bridge. The area of the outer camber is rather more than 3 acres, exclusive of the dry dock on its north side, which is 345 feet long, 50 feet wide at entrance, and has 17¼ feet over sill at high-water springs. The area of the inner camber, in which there is a patent slip, is also about 3 acres. The patent slip is 450 feet long, and vessels of 800 tons burthen, drawing from 10 to 11 feet forward and 15 feet aft, can be taken on it at high water springs.

In the year 1879 there were 296 merchant vessels, belonging to the port, representing 20,354 tons; besides 29 small steam-vessels. The chief imports are timber and grain; there are no exports. The total population of Portsea island in 1871 was 112,980.

Docks.—Her Majesty's dockyard covers an area of 115 acres, its southern portion being chiefly occupied by timber ponds, chain cable, rigging, and sail stores, mast, rope, and boat houses, a boat pond, and a camber; and its northern portion by dry docks, building slips, steam basins, steam factory, and other workshops. Its harbour frontage is about 3,500 feet in length, north and south, and about midway is the entrance to a basin 4 acres in area, with 25 feet in it, and 24¼ feet over sill at high water springs.

Into the east part of this basin open four dry docks, respectively 221½, 275, 279, and 209 feet in length on blocks; 63⅓, 67½, 67½, and 55⅓ feet wide between gates, and 24, 25½, 26, and 20 feet over sills at high-water springs, and 21½, 23, 23½, and 17½ feet at high-water neaps. On each side of the basin is a dry dock opening into the harbour; that on the south side is 228 feet long on blocks, 57½ feet between gates, 19½ feet over sill at springs, and 17 at neaps; and that on the north side, 189 feet long, 53 feet between gates, and 19 and 16½ feet over sill at springs and neaps.

Northward of this latter dock, and facing the harbour, is a dry dock, then follow five building slips, and another dry dock. The two docks, forming a double dock, are respectively 375* and 253¼ feet in length on blocks, 88½ and 65 feet wide between gates, and 27 and 21¾ feet over sills at high-water springs, and 24½ and 19¼ feet at high-water neaps. The slips are

* This dock, 375 feet long, and the one 247 feet long in the south-west corner of the steam basin, can be used as one dock if required.

306¾, 230, 240½, 275, and 299¼ feet in length, and 61¾, 66¼, 65, 64¾, and 68¼ feet wide at entrance.

The steam factory, steam basin, and three other dry docks, occupy that portion of the dockyard eastward of the slips. The steam basin has its opening into Buildings lake, which skirts the north end of the dockyard, off which are moored the ships for gunnery practice. Its area is 7 acres, and there are 25 feet over the sill at high-water springs. The three dry docks have their opening into the basin, two on the east side and one in its south-west corner. They are respectively 307, 401½, and 247¼ feet in length on blocks, 70, 70, and 80½ between gates, and have 22¾, 27, and 27 feet over sill at high-water springs, and 19¼, 24½, and 24½ feet at high-water neaps.

The extension of Portsmouth dockyard is now in progress on the north side of the town of Portsea, and when completed the present area of the dockyard will be more than doubled. The new works comprise rigging, repairing, and fitting out basins, their respective areas being 17, 22, and 14 acres; there will also be five new docks, two locks, besides an extensive factory, with coal stores, &c.

Time Ball.—Greenwich mean time is shown daily, except Sundays, by the dropping of a black ball from the staff of the semaphore in Portsmouth dockyard, at an elevation of 169 feet above the level of high water. The ball is hoisted half way up the staff at ten minutes before, and close up at two minutes before 1 p.m., and is dropped at the instant of 1 p.m. of Greenwich mean time. When the signal fails in accuracy, the ball is rehoisted and dropped again at five minutes interval; if the signal fails entirely the ball is slowly lowered. The position of the semaphore is lat. 50° 48′ N., long. 1° 6′ 15″, or 4m. 25s. West from Greenwich.

LIGHTS.—Southsea Castle.—A *fixed* light, elevated 51 feet above high water, is exhibited from a lighthouse in the north corner of Southsea castle, and in clear weather is visible from a distance of 9 miles. It appears bright *red* in the channel between the Spit refuge buoy and Horse fort, or between the bearings of N. ¾ E. and N.N.E. ¾ E., but it shows *green* to the westward of the Spit buoy, or between N.N.E. ¾ E., and E. ½ N.; to the eastward of the Horse fort it is invisible. When coming from the eastward, it is first seen when bearing N. ¾ E., and is of a faint *red* colour; on that bearing it will lead about 3 cables westward of the Horse fort, and nearly hit the Boyne buoy.

A *red* light is exhibited at each outer end of the Clarence Esplanade pier near the Kings Rooms on Southsea beach, in order to facilitate the approach of steam-vessels at night. A central white light is also shown while steamers are plying.

A *green* light the north outer end, and a *red* light at the south outer end of Victoria pier at the bottom of High Street, Portsmouth; and *red* or *green* lights are shown at the landing places and piers within the harbour.

From the extreme south end of the south railway jetty at the dockyard is exhibited a fixed light showing red between the eastern side of the harbour and the south-east tangent of Blockhouse fort; and green up the harbour westward of that line.

Vessels going alongside the dockyard at night will be clear of the harbour railway works when within the limits of the green light.

SPIT SAND, FORT and LIGHT.—Spit sand is an accumulation of coarse calcareous sand and gravel, thickly mixed up with minutely broken shells, and is a valuable protection to the harbour. No natural formation of rock is found near the surface, but there are numerous patches of large stones the whole way along Haslar beach, probably from the destruction of the neighbouring Government works during heavy gales. The shape of this sand somewhat resembles a cone, the base of which rests on Haslar beach, and occupies the whole distance from Monkton fort to Blockhouse, the apex or spit extending off nearly 1½ miles in a line perpendicular to its base. The general depth over it is from 7 to 10 feet, but some shoal spots have as little as 4½ feet, and are consequently dangerous for small vessels.

One quarter of a mile within the 3-fathom outer edge of the Spit sand is Spit fort, about 210 feet in diameter, and from a small turret 34 feet above high water is exhibited a *fixed* white light.

Hamilton bank dries in spots at the lowest tides, when it has only 5 feet water over its outer end, which is nearly three quarters of a mile from Haslar beach. A dangerous shoal composed of hard coarse sand, named the Ridge, nearly 500 feet in length, and not broader that a boat, lies near the outer end of the Spit sand, and has only 3 feet over it at low-water ordinary springs.

Harrow bank, a shoal patch of gravel and stones, which nearly dries at low water, extends about 2 cables from the beach near Monkton fort, and is much in the way of small vessels coming round Gilkicker point or crossing over from Ryde. They will pass more than one cable south of it by keeping the cupola of St. Paul's church at Southsea in one with the flagstaff on the Kings bastion, until the new Gun-wharf clock-tower is in line with the Round tower; this latter mark—useful for boats—will lead between Haslar beach and the Hamilton bank in not less than 3 feet at low water.

DIRECTIONS.—With an accurate knowledge of the state of the tide, and by attending to the following marks, the Spit sand is not so dangerous for small vessels as is generally supposed. Crossing it from the southward, keep the Dockyard semaphore in line with the Round tower, and it will lead in 6 feet at low water eastward of Hamilton bank. Crossing from the westward, keep a white stuccoed house on Southsea common in one with Dock mill, until the semaphore comes on with the Round tower. The officers houses at the entrance of Gun-boat yard showing just clear of the eastern part of Haslar hospital, leads along the western edge of Hamilton bank in 6 feet water; and the Round tower in one with the Gun-wharf clock leads up in-shore of the bank in not less than 3 feet at low-water springs,—a useful mark for small steam-vessels at a proper rise of tide.

The Swashway beacons on Southsea beach in line E. by N. ¾ N., lead over the Spit, in 8 feet water, midway between Hamilton bank and a shoal patch with 5 feet water, named the Elbow knoll; and when St. Thomas church comes in line with outer angle of Spur redoubt, it will lead up to the Bar marks.

The depths of 8 or 9 feet water across the sand will be found by keeping the spire of St. Jude's church at Southsea in line with the east end of Charlton house—built of yellow and red bricks, standing at the back of the inner Swashway beacon—until the tower of St. Thomas church comes on with the west or outer angle of the Spur redoubt; this latter mark will lead into the fairway in not less than 9 feet at low water.

The marks for clearing the Ridge with only 3 feet water, lying near the south-west extreme of the Spit are, the outer Swashway beacon in line with west tower of Pier hotel; and the Gun-wharf clock-tower in line with the outer angle of Spur redoubt. The new Gun-wharf clock-tower in line with the west or outer angle of the Spur redoubt will lead to the westward in not less than 8 feet at low water.

Bar Knolls.—On the outer bar of Portsmouth harbour, a knoll composed of loose shingle, with 18 feet water, is marked on its western edge by a black can buoy, which lies in 19 feet, with Southsea castle light-house N. by E. ¼ E. half a mile, and the Spit refuge buoy W. by N. ¼ N. 1½ cables. A similar knoll, with 22 feet water, lies S.W. by S. from the above.

The ENTRANCE CHANNEL into Portsmouth harbour, between the end of the Outer Spit and Horse sands is four-tenths of a mile wide, but it narrows considerably abreast Southsea castle, being intercepted by a considerable projection from the main body of the Spit named

the Elbow, which is detached at its outer end only by a deep gut or blind channel.

Southsea beach, with the exception of the shoal off Southsea castle, is steep-to, and may be approached to half a cable without danger till abreast the Bar, where the channel is considerably narrowed by the East sand, a bank of sand and gravel, which commences at the mouth of the harbour, and running parallel with the beach terminates in a spit nearly as far south as the Swashway beacons. The general depth on this sand varies from 7 to 10 feet; but the East knoll, a shoal patch of only 4 feet, lies a little to the northward of the baths, at about half a cable from the beach. A deep gut named Southsea pool runs up inside the East sand, or between it and the beach, having 6 or 7 fathoms at its entrance; but it offers no channel into the harbour, as it gradually narrows into a point, and decreases in depth as its northern end is approached.

Buoys.—There are no buoys to mark the western edge of the Spit but the channel on eastern side of the sand is clearly pointed out by six buoys, chequered black and white. The outer and southernmost one, known as outer Spit buoy, and the Spit refuge buoy, are described at pages 195 and 196, whilst the remainder all being can, are numbered consecutively from 1 to 4, commencing from the S.E.

No. 1 buoy is placed near the south-east point of the Elbow spit, in 5 fathoms, with Southsea castle light-house E. by S. 3 cables. No. 2 buoy lies in 18 feet 2½ cables N.N.W. ¼ W. from No. 1 buoy. No. 3 buoy lies in 18 feet N.N.W. ½ W. 4¾ cables from No. 1 buoy. No. 4 buoy lies in 16 feet N.N.W. ¼ W. about 6¼ cables from No. 1 buoy. These buoys clearly mark the west side of the entrance channel.

Four black can buoys mark the western edge of the East sand, and the eastern side of the entrance channel, they must be left on the starboard hand in entering; No. 1 being the southern or outer buoy, named Bar knoll, is described at page 205. No. 2 buoy is marked "Notice, No vessel to anchor in the fairway," lies in 3½ fathoms with Southsea Castle lighthouse S.E. 4⅓ cables. No. 3 buoy bears from No. 2 buoy N.W. by N. 1¾ cables. No. 4 buoy bears from No. 2 buoy N.N.W. ½ W. 3⅓ cables.

The BAR is formed by a gravel bank which connects the eastern edge of the Elbow with the outer spit of the East sand, and is steep-to on both sides. Prior to 1861 there were only 12 feet over the bar at low-water ordinary springs; it was then dredged to 17½ feet, so that the depth at high-water springs is 30 feet, and at high-water neaps 27½ feet.

Although the channel is narrow on the bar, its limits are well defined in entering by the seven buoys, viz., Nos. 2, 3, and 4, black, on the starboard hand, and Nos. 1, 2, 3, and 4, chequed black and white, on the port hand.

The mark for leading through is the red beacon at the south-west end of Blockhouse fort, in one with the black beacon on the Gosport fortifications, bearing N.N.W. ¼ W.

DIRECTIONS.—It is not customary for Her Majesty's ships to go in or out of Portsmouth harbour without a pilot, neither is it prudent for any large ship to do so, but in small vessels such assistance is not absolutely necessary if ordinary attention be paid to the buoys and the following directions. It may, however, be taken as a general rule, that it is utterly useless to attempt entering against the tide, except with a commanding breeze or under steam, nor should a vessel venture to work in without a pilot.

In sailing inwards with the tide, particularly at its strength (at springs it runs 4¼ knots), the utmost caution must be used; for what with the generally crowded state of the harbour, the constant crossing of the steam bridge, and the numberless boats continually in the vessels track, it is always attended with great anxiety and some risk. The best time for entering is near slack tide, about half an hour before high water, or upon the slack which occurs between the 2d and 3d hour's flood, which continues for about three-quarters of an hour. The flood is strongest between the 5th and 7th hours, and the ebb at the 3d and 4th hour, when its rate at the entrance is 4½ knots.

On the flood in a small steam-vessel, or with a slant of wind in a sailing vessel, it is perhaps best to run well up the harbour past the thick of the shipping, and then turn the vessel's head upon the tide, which will afford time and give facility for taking up a berth; but upon the ebb the vessel may steer direct for her intended berth. Under all circumstances it cannot be too strongly impressed, that judicious and moderate sail, a steady attentive helmsman, with an anchor in constant readiness, are necessary precautions in entering the harbour.

It is not unusual for merchant vessels to secure themselves to the Queen's buoys; and as by so doing they incur a penalty, they are hereby reminded of the risk they run. The commanders of Her Majesty's small vessels are also cautioned not to make fast to the can buoys, which belong to the anchors of the guard ship's moorings.

TIDES.—It is high water, full and change, in Portsmouth harbour, at 11h. 41m., and low water at 4h. 50m.; springs rise 12¾ feet, neaps 10 feet. A narrow stream runs in 15 or 20 minutes after high water. North-east winds keep the tides back; south-west winds have a contrary effect. The highest tide on record occurred during a heavy gale from the

S.W., 13th November 1840, four days after the full moon, when the tide rose 17¼ feet.*

The tide during the first 4 hours of flood rises 6 inches less than in the last 3 hours; and during the last two hours of ebb it falls 2 feet more than in the first 3 hours. The flood in this harbour is also of longer duration than the ebb by about 2 hours—the flowing continues about 7 hours, and the ebbing 5 hours—a condition which is found more or less at Chichester, Langston, Southampton, and in all the harbours of the Solent, and with the unequal rise and fall may be thus explained.

During the first 4 hours of flood the water rises slowly, yet almost uniformly, about 6 feet, apparently supplied by that portion of the incoming or eastern stream in the channel, which splits off the Needles (*see* page 151), one part flowing through the Solent at Spithead. At 4½ hours after the commencement of this stream, or about 9h. 30m. on full and change days, the western stream has made inshore all along the coast, from Selsea bill westward to the bill of Portland.

This western stream unites with the last of the eastern stream round the eastern end of the island, and runs back through Spithead, giving increased effect to that same incoming stream of flood in the Channel by contributing to fill the harbours in its progress to the westward in an accelerated degree, and also to prolong the duration of the rising tide, until the stream has turned in the offing a little after 11 o'clock, thus making a whole flood, or rising tide, of 7 hours. So long as the western stream maintains its strength through Spithead, the water is kept up or prevented from falling out of Portsmouth harbour, and this check holds out until the stream at Spithead slackens, when both Portsmouth harbour and Southampton water rapidly empty themselves.

On the Spit sand, with the Swash marks in line, the stream turns nearly the same time as at Spithead. The first 4 hours of flood sets towards Southsea beach from one quarter to three-quarters of a knot, the remaining 3 hours towards the harbour, about three-quarters of a knot. The ebb sets first West, then S.W. and S.E., at the last 2 hours towards the Spit buoy, from one to 1½ knots.

At the Spit refuge buoy the streams turn a little later than at Spithead. The first 4 hours of flood runs E.S.E. towards Langston bar; during the 5th hour it turns and sets weakly towards Southsea castle; the remainder of the tide sets at the rate of about one knot towards the harbour. The direction of the ebb is the same as in the Swashway, but its rate is less.

* The zero or datum of the soundings on the chart is 5 feet 8 inches on Master Attendant's Tide-gauge, which is equivalent to 7 feet below the mean level of the sea the zero of the Admiralty Tide tables is 6 feet 4 inches below that level.

Off Southsea castle the flood turns a little earlier than at the Spit buoy; its direction is the same, but its strength is greater. The ebb sets W.S.W., then South and S.E. for the last 3 hours, with a velocity of 2½ knots.

On the Bar the flood makes towards the harbour at 8h. 15m., or 3½ hours before high water. The first half sets, as in the Swashway, weakly towards Southsea beach; the rate of the latter half is about 1½ knots, which increases to 4¼ knots at the entrance of the harbour, when it gradually decreases to 2¼ knots abreast the dockyard, and to 1½ knots off Hardway. The ebb does not make to the S.E. on the Bar till about 1h., being influenced by the Spithead tide; it runs weakly at first, but the last 3 hours it sets through the harbour channel at the rate of 2¼ knots; at the 4th hour its rate at the entrance is 4½ knots.

It is high water, full and change, at Fareham, in the channel close to the upper town quay, at 11h. 47m., and low water at 4h. 30 m.; springs rise 11¼ feet above the level of low water (there are then only 9 inches water in the channel), and neaps rise 8½ feet. At springs (2 days after full and change) the tide begins to rise about 1½h. after, and at neaps 18m. after, low water at Portsmouth. The flood stream ceases about high water at the quay, stands about 10 minutes when the ebb commences. At Fareham bridge, just below the mill, it is high water at about the same time; springs rise 7½ feet, and neaps 4¾ feet. At springs the tides begin to rise at the bridge 4½ hours after low water at Portsmouth.

In Porchester lake, off the castle, it is high water at 11h. 45m., and low water at 4h. 55m.; springs rise 13½ feet, neaps 10¼ feet. The flood stream ceases about one quarter of an hour after high water, stands about 7 minutes, when the ebb commences.

In Hilsea creek, about one-third of a mile west of Portsbridge, it is high water at 11h. 47m.; springs rise 6½ feet above the bed of the channel (the channel at springs is dry at 4½h. after high, or about 25m. before low water at Portsmouth, and at neaps at 3h. 35m. after high or 1¼h. before low water there), and neaps rise and range 4 feet; this channel remains dry about 5½h. at springs, and 6h. at neaps. At springs the tide begins to rise 5h. after low, or 2¼h. before high water at Portsmouth, and at neaps 4¾h. after low, or 2h. 40m. before high water there. A spring tide rises only for about 2h. 20m., a neap tide 2h. 45m.

At Spithead, and anywhere between the Bramble and Horse sands, the eastern stream, at full and change, makes at 2h. 0m.—about 2½ hours after high water in the harbour—and runs 7 hours S.E. by S.; and the western stream at 9h. 0m.—about 2½ hours before high water in the harbour—and runs 5 hours N.W. by N. This inequality is caused by a strong counter stream running from Southampton water to Bembridge for 2 hours; for as soon as the western stream at Spithead has slacked, the rapid discharge

from Southampton water and Portsmouth harbour produces such an increased velocity in the back water as to turn or beat back from its course the languid stream through Spithead. Thus the western is converted into an eastern stream, until the channel widens between the Horse and Bembridge point, where—near the Nab—it meets the regular channel ebb, and the confluent streams sweep round to the southward of the Isle of Wight. Thus the ebb for the last half of its duration runs in opposite directions on the two sides of the eastern half of the Isle of Wight.

At the Dean Elbow, the eastern stream which sets over that shoal makes at 2h. 0m., runs to the S.E. for two hours, and then East for the remainder of the tide, 5½ hours; the western stream makes at 9h. 45m., and runs W.N.W. 4¼ hours.

Near the Horse Elbow, the tide must be strictly attended to, for in many cases it sets directly over that shoal. The eastern stream makes at 2h. 0m. or 2½ hours after the tide on the shore, and runs to the S.E. 7¼ hours; the western stream makes at 9h. 15m., or 4¾ hours after low water on the shore, and runs nearly 5 hours to the N.W.

At the Warner light vessel the eastern stream makes at 2h. 0m., and runs 7½ hours about S.S.E.; and the western stream at 9h. 30m., and runs nearly 4½ hours N.N.W.

At the Nab rock, the tidal stream is nearly rotary, which is probably caused by the Spithead tide meeting the tide round Dunnose somewhere near the rock; for instance, at the 1st hour's flood, by the shore it sets East; 2d and 3d hours, E.N.E.; 4th, N.E.; 5th, N.E. by N.; 6th, North; 7th, N.N.W. to N.W.; and the last drain of the flood, N.W. by W. The 1st hour's ebb sets W. by N.; 2d, W. by S. to W.S.W.; 3d, S.W. by W. to S.W.; 4th, S.W. ½ S.; the 1st part of the 5th hour, S.S.W., gradually trending to the southward until low water by the shore when its direction is S.E. There are only a few minutes slack. At full and change, the western stream makes at 11h., and the eastern stream at 4h. 30m. As this latter stream sets for 5 hours towards Bracklesham bay and the entrance of Chichester harbour, the mariner must be on his guard, especially in thick weather.

At the N.W. Princessa buoy, the western stream makes at 10h. 0m., and runs 6 hours W. by S. ½ S. The eastern stream commences at 4h. 0m., and sets nearly E.N.E. At the S.E. buoy the tides are about half an hour later, and set as follows:—the western stream, first part, W. ¾ S., gradually becomes more southerly, and at the last of the tide runs S.W. by S. The course of the eastern stream is nearly the same throughout the whole of the tide, E. by N.

The greatest velocity of both streams is as follows:—At the Princessa, eastern stream nearly 2 knots, western stream 2¼ knots; at the Nab rock,

eastern stream about one, western stream 1½ knots; at the Dean Elbow, eastern stream 1¾, western stream 1¼ knots; at the Warner, eastern stream 1½, western stream 2 knots; and at Spithead, eastern stream 1¼, and western 1¾ knots.

LANGSTON HARBOUR separates Portsea island from Hayling island, and its entrance, between Cumberland fort and Gunnen point, lies E. ¾ S. 2½ miles from Southsea castle. It is utterly worthless as a port except for vessels of very light draught, as its bar nearly dries at low water, and it can only be entered by crossing the Horse and Dean sand.

The gravel banks, which dry off for at least one mile from the mouth of the harbour on both sides, are named, East Winner and West Winner. The former runs nearly straight out from the coast; but the latter, after extending three-quarters of a mile, suddenly turns to the eastward towards the spit of the other, almost blocking up the entrance, there being only one foot water between them on the bar at low spring tides. These banks frequently shift, and in height they are seldom the same before and after a gale of wind. When surveyed in 1872 there were only 7¾ feet over the outer bank at high water, and not more than 7 feet upon the inner part of the eastern Winner. In blowing weather, if there is any swell outside, there is one sheet of broken water over them, with heavy rollers. Haslar hospital open of Southsea castle N.W. leads to the southward of the banks in 9 feet at low water.

Langston Fairway buoy, conical, painted with black and white horizontal bands, and marked L. F. W., lies in 1¾ fathoms just within the bar, and N.E. 1½ cables from the highest bank, which has only 6 feet water over it at high-water spring tides. From the buoy South Hayling church spire bears E. ¾ N., and Milton church spire is three times its width open west of the engine chimney N.W. ¾ N.

Directions.—As the tide sets with great velocity between the entrance points of Langston harbour and in the channel when the banks are uncovered, it would be useless for a sailing vessel to attempt entering against it; the best time for running in is about an hour before high water. It makes into the harbour on full and change days, at 5h. 0m., and out or to the southward at 12h. 0m., which is 20 minutes later than high and low water by the shore; springs rise 13½ feet, neaps 10½ feet, but uncertain to a foot or two.

In running over the bar into the fairway channel of the harbour, bring the west end of the officers house in Cumberland fort in line with the eastern end of the large chalk-pit on Portsdown hill bearing N. by W.; or keep the coast-guard flagstaff on the north side of Eastney point in line

with Langston fairway buoy N. ¾ E.; and immediately on passing the buoy the water will deepen and the vessel will be in the channel, when a course should be steered between the points. There are no regular pilots for the harbour, but if none of the local fishermen are at hand the anchor should be dropped when in safety, and wait for further assistance.

HAYLING BAY is between Langston and Chichester harbours, and its shore, which is the southern face of Hayling island, is one uninterrupted line of shingle. Many of the objects near the coast on this island are useful and familiar sea marks; the most prominent are Hayling church, the trees in the village, and the new buildings near the beach, including Westfield lodge, a large house with a tower, and the life-boat house. To the eastward of the Dean Elbow buoy rather deeper water may be carried closer in-shore, but the difference is scarcely appreciable until about one mile eastward of Chichester harbour. The soundings are, however, so regular, and the water shoals so gradually, with a few exceptions, that there can be no difficulty in keeping off a proper distance according to the vessel's draught.

A Life Boat is stationed at Hayling island.

Hayling Shoal.—A small patch of foul ground, known as Church rocks, lies about one mile eastward of Langston harbour; but being close in-shore, forms no prominent shoal. There is, however, outside the Church rocks, at 1½ miles off shore, a small gravel bank named Hayling shoal, with only 8 feet water over it, and 14 feet between it and the land. From the shoalest part, Southsea castle bears N.W. by W., Hayling church spire N.N.E. ¾ E., and Cackham tower, is its own breadth open south of Berry barn E. by S. The tower in one with the barn leads to the northward; and Haslar hospital open of Southsea castle bearing N.W. leads to the southward of Hayling shoal.

CHICHESTER HARBOUR has its entrance 3½ miles eastward of Langston harbour, and the watch-house on the eastern point bears N.W. ¾ N. 6½ miles from Selsea bill, and N.E. ¼ E. $5\frac{2}{10}$ miles from the Nab light-vessel. Although a considerable trade is carried on in this harbour, the entrance to it is bad, as the bar has only 2 feet over it at low-water springs; and a shoal flat, which is a continuation of the Horse and Dean sand, extends off abreast it for at least 2 miles, with not more than 15 feet water.

The gravel banks dry 1½ miles from Watch-house point, the eastern point of entrance, and are known as East Pole sand, which is high in some parts, and constatly undergoing alteration with each gale of wind, and spring tide during the winter months. The general direction of the banks is about W.S.W., thus throwing the entrance of the harbour to the west-

ward, the reverse of Langston. When surveyed in the summer of 1843, the higher banks were a long way out and had not more than 5 to 6 feet over them at high-water springs. On the western side of entrance, a bank of inconsiderable extent, named the West Pole, runs out about one quarter of a mile from Eastoke point.

Tides.—It is high water, full and change, in Chichester harbour, at 11h. 30m., and just within the entrance, springs rise 14 feet, neaps 11 feet. About one mile outside the bar, the set of the stream is nearly rotatory and of little strength, turning to the eastward at 4h. 50m., and to the south-west at 0h. 45m.; between the points and in the channel over the bar, when the banks are uncovered, it runs with great force.

Directions.—No prudent seaman, without a thorough knowledge of this harbour, should attempt it without a pilot, who will be found constantly on the look-out at tide time at the entrance, as there are no buoys or beacons to mark the channel. Should circumstances, however, render it necessary to take the harbour without a pilot, care must be taken to preserve a tolerable offing until a proper rise of tide for entering; and for this purpose, it should not be approached nearer than to have Haslar hospital open of or just touching Southsea castle, which will insure 3 fathoms at low water. In fine weather and a smooth sea an anchor should be dropped under foot, if too soon upon the tide, and as the ground is everywhere good, the position chosen for so doing must depend upon the direction of the wind. As there is no channel into the harbour, except to the westward of the East Pole, do not anchor farther eastward, in westerly winds, than to have the coast-guard watch-house to the eastward of Bow hill.

Approaching from the southward or eastward, especially with the wind in that direction, the best mark for crossing the bar is, the watch-house on Watch-house point in line with a remarkable plantation to the eastward of Bow hill, N.E. by E. $\frac{1}{4}$ E.; this will lead well into the fairway, and when there, which the increased depth of water will give a sufficient warning of, steer up between the points, the nearer in mid-channel the better, as on the strength of the tide the eddies are strong on both sides, either within or without the points, according as it is flood or ebb.

Entering from the westward run with Cackham tower in one with Berry barn, E. by S. $\frac{1}{4}$ S., which will lead to the northward of Hayling shoal, and over the bar, in 17 feet at high-water springs; but as this line points to the highest part of the East Pole, do not continue on it longer than to have the fairway mark on. When there is any swell outside, the sea breaks furiously over the sands, and even across the entrance, particularly with southerly winds on an ebb tide.

If bound to Emsworth, enter the Emsworth channel, which is close to the high shingle point on the western side of the harbour; but as it would be folly to attempt to proceed farther up without a pilot, the anchor should be dropped to prevent confusion, and as there is no avoiding the strong tide (which on the ebb is rapid), a good look-out must be kept in the event of the vessel driving.

In the eastern or Chichester branch, there is fair anchorage for many vessels, even of considerable burthen; but a sort of Inner Bar or shoal flat connects Watch-house point with Gardner head, and a vessel, to have the best water over it, must bring the old cottage at East Saltern in line with the high-water shingle point on the western side of Emsworth channel. This mark will lead to the anchorage, which may be said to commence about half a mile eastward of the watch-house, or soon after passing the coast-guard hulk, in 4 to 5 fathoms at low water.

With a probability of remaining any length of time at this anchorage, it would be prudent to steady the vessel with a stream anchor, and for this purpose the small bower should be let go near the middle of the stream, and the small anchor carried over towards the southern mud; veer upon the bower and heave in upon the stream, which will take the vessel out of the strength of the tide, and also out of the fairway, and she will have open hawse up the harbour, which is advisable, as the ebb rushes down with great rapidity. The bower will also be a safe precaution against driving over upon the southern mud, which there would be some danger in doing in strong northerly winds. Chichester lake is navigable to Dell quay, within 2 miles of the city.

A Life Boat is stationed at Chichester harbour.

The Coast from Chichester harbour to Selsea bill runs nearly in a straight line 6½ miles, and forms a low earthy bank, which is seriously encroached upon by the sea. There are many conspicuous objects near the shore, which being useful sea-marks, it may be well to point out their relative positions.

Berry barn is a large and remarkable building close upon the edge of the coast, about one mile eastward of Watch-house point, and is the second building from it; Oxtall barn is about half a mile to the westward. West Wittering church, with a spire, is conspicuous, and stands a short distance back. Cackham tower is a high brick ruin, one quarter of a mile to the eastward of Berry barn, and about the same distance back from the coast; it has a plantation near it. The little village of Circum runs close down to the coast, and may be known by a row of white houses near the beach belonging to the coast-guard, the first station east of Chichester harbour. Circum windmill, a useful mark, stands at the back of the village, and the first farm building to the eastward is Bracklesham farm.

Thorney coast-guard houses are 2¼ miles to the south-eastward of the coast-guard station at Circum; and three-quarters of a mile to the eastward of the above, and rather more than one-third of the distance to Selsea bill, is Medmery barn, one of the objects used for clearing the Boulder bank. Selsea windmill stands one-quarter of a mile to the eastward of Medmery barn and farther back. The coast-guard houses at Street, a useful sea mark, are between Medmery barn and Selsea bill; and immediately behind them stands a remarkable high house at the south end of the village of Selsea, or, as it is sometimes called, Street.

SELSEA BILL, the eastern entrance point to Spithead, is a low projection of the coast, and shows as a remarkably sharp low point when seen from east or west.

Fishing Light.—From the watch-house on Selsea bill is exhibited a fishing light which shows *green* between the bearings of West and N. ½ W., and red between N. ½ W. and N.E. by E.; the light is visible in clear weather from a distance of 6 miles.

A Life Boat is stationed at Selsea bill.

Directions.—Small vessels under 14 feet draught may turn to windward in-shore out of the tide in Bracklesham bay frequently with advantage, by a close attention to the lead and the following directions, taking care not to stand within half a mile of the shore, as the bank is steep-to, shoaling suddenly from 4 to 2 fathoms.

A vessel will be to the eastward of the East Pole sand when Cackham tower is in one with Chichester spire; to insure clearing the whole of the shoal flat which extends off Chichester harbour, the coast should not be approached until the cathedral is open eastward of Circum windmill; and thence to the Street rocks the bay is safe, with the exception of the Medmery bank and the Hounds rocks.

Medmery Bank, lying 2 miles from the coast and W.S.W. of Medmery barn, is rather an extensive shoal of gravel and broken shells, and nearly streams with the entrance into the Looe. Its direction is N.W. by N. and S.E. by S., three-quarters of a mile long, and not less than half a mile broad. The marks for the shoalest part of 13 feet, which is near its centre, are:—Selsea mill in one with the Luff—a clump of trees on the left shoulder or western part of the high ground to the eastward of Rooks hill—bearing N.E. by E. ¾ E.; and Belmont castle in line with the watch-house N. by W. ½ W. The north-east end of the large chalk pit on Portsdown hill in line with the south-west end of Hayling trees, will lead in 4 fathoms to the westward of the bank; the watch-house on the eastern side of entrance to Chichester harbour N.N.W. leads to the eastward; and Bracklesham farm, in line with Bow hill, leaves it to the southward.

BULLOCK PATCH.—As there is but little less water on [illegible] bank than over the patch in taking the Looe channel, it is not a danger to vessels attending to it; but it would be inconvenient for those of large draught to come within the line of the Boulder bank. The rocky patch of 2½ fms. named Bullock patch lies W. ½ N. nearly 3 miles from Selsea bill. Ashey Down tower in line with Bembridge church spire W. by N. ¾ N. leads close to its southern edge.

Buoy.—About 2 cables south-west of the south end of the patch a black can buoy is moored in 6 fathoms, with Ashey Down tower, open south of Bembridge church W. by N. ¾ N.; Nab light-vessel N.W. by W. ½ W. 3 [illegible] miles; Dean Tail buoy N.W. ¾ N. 3 [illegible] miles; and Boulder buoy S.E. ¼ E. 3 [illegible] miles. Should the buoy be gone, a bearing of Ashey Down tower or of Nab light-vessel will enable a ship to keep outside the patch, until the east end of the large chalk pit on Portsdown hill comes on with east end of Cumberland fort.

Hounds Rocks are connected with the coast at their eastern end immediately under Thorney coast-guard houses, and uncover at spring tides for rather more than half a mile off-shore in a W.N.W. and E.S.E. direction. Nelson monument over the west end of Hayling trees leads one mile outside them.

There is a small patch with 2½ fathoms water, three-quarters of a mile W.N.W. from the Hounds rocks, and 1$\frac{1}{5}$ miles from the shore; there are 6 fathoms close to all round it.

CHAPTER VI.

SELSEA BILL TO NORTH FORELAND.

VARIATION in 1882.

Shoreham harbour	18° 20′ W.	Dungeness	17° 45′ W.
Newhaven	18° 10′ W.	Downs	17° 30′ W.

The OWERS appears to be applied indiscriminately as the general name for the foul ground off Selsea bill, as well as the extensive and dangerous patches of rock at least 5 miles south-east of it. With the exception of the narrow channel known as the Swashway, these dangers form an almost continuous ledge of dangerous rocks; but as distinguishing names, well known to the local pilots and fishermen, have been given to the different parts of this shoal, they have been adopted in the following description.*

The Streets.—About three-quarters of a mile westward of Selsea bill, and abreast the High house at Selsea street, the Owers have their commencement, and run off in two parallel ledges, named the Streets, which are awash at the lowest tides to the distance of one mile S.W. by W. from high-water mark; thence they trend suddenly S.E. by S. for rather more than three-quarters of a mile under the name of the Grounds or Malt Owers at their western end, and the Dries at their eastern end.

Buoy.—About one-quarter of a mile southward of the Dries, a conical black buoy is moored in 12 feet, with Selsea coast-guard houses N. by E. $\frac{3}{4}$ E., and the Mixon beacon E. $\frac{1}{2}$ S. $1\frac{4}{10}$ miles.

The Mixon.—One mile E.S.E. of the Dries is a considerable mass of rocks known as the Mixon, the highest and eastern end of which covers at a quarter flood. Between the Mixon and the Dries there are 10 to 14 feet water, gradually shoaling to the shore.

Beacon.—The beacon, erected on the highest part of the Mixon close to the eastern end, is a useful object for vessels navigating the Looe, and a valuable sea mark for the outlying dangers; it consists of an iron pillar

* *See* Admiralty charts:—Owers to Christchurch, including Spithead and the Isle of Wight, No. 2,045, scale, $m=1\cdot4$ inches; Owers to Dungeness, No. 2,451, scale, $m=0\cdot5$ inch.

with cage 30 feet above high water, and lies about S. by E. one mile from the southern rounding of Selsea bill.

An extraordinary deep hole, of no great extent, having 12 fathoms in the deepest part, is scooped out near the south-east end of the Mixon close to the face of the rock. At low water there is no channel between Selsea bill and the Mixon, as they are connected by a gravelly bank interspersed with mud and weed, which dries at low-water springs.

Brake or Cross Ledge is a continuation of that portion of the Streets shoal known as the Dries, in a S.W. by W. direction, and forms a rocky bar with from 10 to 21 feet across the western entrance to the Looe.

Boulder Bank.—The northern end of this dangerous shoal is on the south side of the western entrance to the Looe, and extends in a south-westerly direction for one mile, whence it trends 3½ miles S.E. by E. to the end of the Middle Owers, forming an extensive and almost continuous shoal, though distinct names are assigned to different parts. That portion known as Boulder bank is composed of gravel, stones, and rocky heads, and has on its shoalest part only 2 feet water, whence the spire of Chichester church open west of Selsea mill bears N.N.E. ½ E., and the Mixon beacon, E. by N. ¾ N.

The Pullar buoy, conical, with black and white vertical stripes, and surmounted with staff and cage, is placed at the north-east or inner end of the Boulder bank, in 12 feet, and marks the southern boundary of the entrance to the Looe; from it Chichester church spire is on with lower grove of trees west of Selsea mill N.N.E. ½ E.; the Mixon beacon, E. ¾ N.; and Boulder bouy, S.W. ¼ S., a little more than one mile distant.

The Boulder buoy, conical and black, lies in 9 fathoms off the south-west angle of Boulder bank, midway on the line of bearing between the Owers and Nab light-vessels, with Chichester church spire in line with Medmery barn, N.N.E. ¾ E.; Nab light vessel, N.W. ¾ W. $6\frac{4}{10}$ miles; Bullock patch buoy, N.W. ¼ W. $3\frac{4}{10}$ miles; and Owers light-vessel, S.E. ½ E., Easterly, 6 miles.

Middle Owers is the eastern portion of the extensive shoal just described, and limits the principal or main Swashway to the westward. It is composed of large blocks of stone, or rock, alternating with patches of coarse gravel, having one dangerous head, which nearly dries at low water.

The Middle buoy, can, and chequered black and white, lies in 5 fathoms, one eighth of a mile inside the shoal just abreast the shoalest part, with Chichester church spire its apparent length east of Selsea corner,* N. by E.; East bank buoy, E. ¼ S., $3\frac{2}{10}$ miles; and Owers light-vessel, S.S.E. ½ E., 3 miles.

* Selsea corner is difficult to distinguish.

Between the Boulder bank and Middle Owers are two narrow channels which show distinctly when the tide is running, by the ripples over the shoals near them; and as they carry 3½ to 4 fathoms water, they might serve a useful turn to small vessels, although from their extreme narrowness they can scarcely be recommended as safe. The Mixon beacon in one with the first clump of trees eastward of Pagham church N.E. by N., leads through the western channel in about 20 feet; and the beacon in line with Chichester spire N. by E. ½ E., leads through the eastern channel, but in rather less water.

The SWASHWAY.—Between the Middle Owers and the West Head of the Outer Owers is a channel known as the Swashway, 8 cables broad between its 3-fathom lines, and with from 5 to 7 fathoms water; but though thus available as regards space and depth for ships of moderate draught, it is not recommended, for the saving of distance would be scarcely appreciable, whilst there is a possibility of a ship being entangled amongst the shoals flats in the Park.

Should the Swashway be used, the following marks will lead through in safety, though it must be borne in mind that the objects are distant, and not readily recognized by strangers: Kinnaird house in one with Clarence hotel at Bognor, N.E. ¾ N., leads through on the western side of the channel; Mixon beacon on with coast-guard house at Selsea street N.N.W., leads through on the eastern side; whilst Selsea corner in one with the White way on Bow hill N. ¼ E., leads through in mid-channel. After passing through from the southward with either of the above marks, the Middle Owers buoy should be brought to bear W. by S. ¾ S., and an opposite course steered to pass between the inner end of the Outer Owers and the shoal patches to the northward.

OUTER OWERS is the outer and most dangerous of the numerous shoals off Selsea bill, and its off-lying position, combined with strong tide and heavy seas during southerly gales, renders it one of the most formidable dangers in the English channel. The shape of the shoal is very irregular, and its limits difficult to define, but it occupies an extent of no less than 2 miles N. by E. and S. by W., and the same distance east and west.

Over a considerable extent of the Outer Owers there are not more than 12 feet water; but there are only 2 to 3 feet over that part named the Shoal of the Lead, from which Chichester spire appears halfway between Pagham church and a single tree, which is a remarkable object near the coast a short distance to the eastward of the church, N. ⅛ W.; and Mixon beacon, N.W. by N.

The Ebow, which is the outer or southern prong of the Outer Owers, lies S.S.W. nearly three-quarters of a mile from the Shoal of the Lead. As there are no good marks to define its position, great caution must be

observed in approaching it, as it is steep-to, there being 30 fathoms water within one hundred yards of its extreme point.

Eastborough Head is the name given to the extensive mass of rocks with only 6 feet water over them, forming the inner part of the Outer Owers. Although a narrow gut with 4 fathoms separates this head from that part of the main danger known as the Shoal of the Lead, there is no available passage.

A reef of rocks, named the West head, is the western extremity of the shoal, extending in a westerly direction from Eastborough head, and forms the eastern boundary of the Swashway.

EAST BANK, consisting of gravel and sand, is of comparatively recent formation, and though detached from the main body of the Outer Owers, may, for all practical purposes, be considered a part of that danger. As the least water on East bank is 19 feet, it should be carefully avoided by vessels of large draught.

Buoy.—A conical buoy, chequered black and white, with staff and cage, is placed a short distance eastward of the shoalest part of the bank in $4\frac{1}{2}$ fathoms; but as $3\frac{1}{2}$ fathoms water will be found some distance outside the buoy, it should not be passed within one third of a mile. The marks for the buoy are Pagham church, N. by W. $\frac{1}{2}$ W.; Mixon beacon, N.W. by W., $4\frac{2}{10}$ miles; and Owers light-vessel, S.W. $\frac{3}{4}$ S., Southerly, 3 miles.

Although there are 26 feet water in the passage between East bank and Eastborough head, the leading mark for which is Pagham watch-house open east of Chichester spire, and bearing N. $\frac{1}{4}$ W., it should never be attempted by strangers.

OWERS LIGHT-VESSEL, moored in 16 fathoms, S. by W. $\frac{3}{4}$ W. six-tenths of a mile from the south spit of the Outer Owers, exhibits at 34 feet above the sea a *revolving* light, showing white and *red* flashes at intervals of *half a minute*, in the order of two white and one *red*; which should be visible in clear weather from a distance of 10 miles. The vessel has one mast, is painted red, with the word *Owers* on her sides, and carries a red ball at her mast head.*

Fog horn.—In thick or foggy weather a powerful fog-trumpet will be sounded, *six* blasts *every minute*,†—a blast every ten seconds—and a gun fired if a vessel be seen standing into danger. From the light-vessel Chichester cathedral and Pagham church spires are in line, bearing North; Mixon beacon, touching the north-east end of a low slated building next west of the high house on Selsea bill, N.N.W., Northerly; east extreme of Shoal

* For light-vessels' riding lights and signals, *see* page 26.

† Mariners should remember that the fog trumpet at St. Catherine's lighthouse, gives *two* blasts in quick succession every 4 *minutes*.

of the Lead, N.E. by N., distant $1\frac{3}{10}$ miles; East bank (Eastborough head) buoy, N.E. $\frac{3}{4}$ N., Northerly, distant 3 miles; Boulder bank buoy, N.W. $\frac{1}{2}$ W., Westerly, distant 6 miles; Nab light-vessel, N.W. $\frac{3}{4}$ W., distant $12\frac{8}{10}$ miles.

Bank.—Outside the Owers, from the Boulder bank to one mile eastward of the Elbow, in an extensive field of rock with 7 to $9\frac{1}{2}$ fathoms water over it, which presents to the mariner, by a close attention to the soundings, a warning of his approach to the Owers. Abreast the Boulder it runs off about 3 miles to the S.S.W., having 12 to 17 fathoms water inside it; but the deep water does not continue farther westward than the west end of the Boulder, its western limit being pretty accurately defined by the mark for clearing the Cross ledge.

Hooe Bank.—To the eastward as the Outer Owers is approached, the rocky bank just described narrows considerably, forming a sort of tail to the main body, and partially separated from it by a narrow swash of rather deeper water; this part is named the Hooe bank, which is 3 miles long, E.S.E. and W.N.W., and about one quarter of a mile broad, the outer part being nearly $1\frac{1}{4}$ miles from the Elbow. Bersted church in line with Goodwood, N. by E., leads eastward of the Hooe, as it does also of the East bank.

The least water on the Hooe is about 8 fathoms; and as little water as the above will occasionally be had on the western or large bank; but the soundings within the Hooe range from 13 to 30 fathoms, the greater depth being near the south-western edge of the Elbow. The Hooe clearly shows itself by the overfall of the tide, which occasions a heavy broken sea, when running to windward in blowing weather.

The LOOE STREAM, lying as it does within the whole line of dangers, barred at its western entrance by turbulent overfalls, and having in many parts of it not more than 16 feet at low water, is only adapted for vessels of small draught, or by those possessing local knowledge, except under the most favourable circumstances. Great caution is also requisite not to be caught in it by night; and the seamen should not take the passage except with a strong breeze and plenty of time before him to be certain of getting through in daylight, neither should a sailing vessel attempt it with an adverse tide.

Approaching the Looe from the westward, take care not to get too close in-shore; and as the Cross ledge is approached, the Mixon beacon should not be brought to the northward of the Dries buoy, or Nelson monument must be well open of Hayling trees; by neglecting some such precaution as this, a stranger is likely to get entangled with the Streets, and as the eastern stream sets strongly towards the Boulder bank, some caution is necessary in light winds.

Crossing the ledge, between the Dries and Pullar buoys, give the Dries buoy a sufficient berth, for there are only 11 feet water one quarter of a mile south of it; and the nearer the Pullar buoy the better, but always leave it to the southward. If the Isle of Wight is tolerably clear, an excellent mark for leading over the Cross ledge and the whole way through the Looe in 14 feet water is, Little See-me-not just showing south of Culver cliff, bearing W. by N. The Pullar buoy on with Culver cliff, is a good line for leading through the Looe. When Mixon beacon bears North or N. by W., the vessel may be considered as through the channel, and entering into that part of Pagham bay known as the Park.

Small vessels under favourable circumstances, and in fine weather, frequently work through the Looe. In standing to the southward do not bring the Middle buoy to bear more easterly than S.E. by E., and in shooting over the Cross ledge contrive to pass near the Pullar buoy. When eastward of the middle buoy do not attempt to pass it to the southward, until Kinnaird house is in one with the Clarence hotel at Bognor, N.E. $\frac{5}{8}$ N., which is one of the Swashway marks.

On the north side of the channel, do not stand so far over as to get between the Dries buoy and the Mixon, for the rocks are high and dangerous; the buoy should not be brought to the westward of N.W. by W. Abreast the beacon the rocks are steep-to, but still it will be better on account of the strong eddies to give it a moderate berth. To the eastward of the Mixon stand no farther northward than to have the beacon bearing West, which will ensure 15 feet at low water.

Tides.—It is high water, full and change, at Selsea bill, at 11h. 45m.; springs rise 16½ feet, neaps 12½ feet. At the western entrance of the Looe, near Pullar buoy, the eastern stream makes at 3h. 45m., and the western stream at 10h. 0m., and they set S.E. and N.W. Between 2 and 3 miles outside Boulder bank, the stream turns about an hour later; the eastern stream running E.S.E., and the western stream West; and between Boulder bank and Middle Owers the streams run in the same directions. At the eastern entrance of the Looe, near Eastborough head, the eastern stream makes at 4h. 30m., and sets E. by N. ½ N., and the western stream at 9h. 50m., and sets West. Off the west end of the Hooe bank, the eastern stream makes at 4h. 35m., and set E.S.E., and the western stream at 10h. 30m., and sets W. ¾ N.

DIRECTIONS.—The course and distance from about 4 miles south of St. Catherine point to a similar position off Beachy head is E. ¾ S., 59 miles. By pursuing this route a vessel will pass about 4 miles southward of the Owers light-vessel, and will not be materially affected by the indraught between the Isle of Wight and the Owers on either tide. After

passing St. Catherine point, if the weather be thick, the shore should not be approached within the depth of 20 fathoms, by which precaution she will pass well outside the Owers and preserve the fair channel tide.

The soundings between the Isle of Wight and Cherbourg are irregular. The general quality of the bottom to the southward of the fairway is coarse, loose, or rocky; and the stones are generally covered with reddish incrustations. Within the distance of 15 miles of the coast of Hampshire and Sussex the soundings become finer, being chiefly sand mixed with fine gravel, which continues as far eastward as Beachy head.

The Owers light-vessel when seen will be a good guide either for passing south of the Owers, or for avoiding those dangers when turning to windward. A vessel will be westward of the Boulder bank when the west end of Medmery barn is in line with the spire of Chichester church, N.N.E. $\frac{3}{4}$ E.; abreast of the Middle Owers when Pagham church comes on with Rooks hill, N.N.E.; and eastward of the Outer Owers and the East bank when Bersted church is in one with Goodwood, N. by E. In clear weather, the red clay cliff in Sandown bay, Isle of Wight, open south of Culver cliff, although a distant mark is a good one, and will lead $1\frac{1}{2}$ miles south of the Boulder bank, and three quarters of a mile south of the Outer Owers.

At Night, the bearing of the Owers light and a careful attention to the lead will be the best safeguard when approaching these shoals. Steering to the eastward from Spithead, the Nab lights kept on a N.W. $\frac{1}{2}$ N. bearing astern, will lead about 2 miles south-west of the Boulder bank; but if these lights are lost sight of before the Owers light is seen, take care to allow for the eastern stream, if it is running, as it will be on the vessel's beam, setting strong towards those dangers, especially after south-westerly gales. When the Owers light is sighted a course may be shaped to pass to the southward of her, but the light should on no account be brought to bear more southerly than S.E. by E.

Turning to windward between Beachy head and the Owers, do not stand into less than 10 fathoms at low water, nor bring the Owers light to the southward of S.W. After passing any convenient distance to the southward of the light, by not bringing it more southerly than S.E. by E. $\frac{1}{2}$ E. will clear the shoals; but this is a close mark for a large vessel, and it will be prudent not to cross the rocky banks. There can be no danger so long as the Nab lights are not brought to the westward of N.W.

The depth of 10 fathoms is also a valuable guide for vessels between the Owers and Dunnose; for by keeping outside it they may be assured of being clear of all danger as long as the Nab lights are to the northward of N.E. by N.; after which St. Catherine light had better be kept in sight. If near the western end of the Boulder bank, and steering for the Nab during the western stream, a vessel will have it about two points abaft the

large thick circular grove of trees 964 feet above the sea, which is frequently the first object seen on making the land. A reference to this object would often assist the mariner when all others are too low or indistinct to be observed.

The coast above Shoreham is low, showing a deep valley of the river Adur, between Shoreham and Lancing; but Lancing circular grove, Lancing white mill, the town of Shoreham, the high coke chimney near Shoreham harbour, Copperas and Portslade mills, and the town of Brighton are objects easily recognized.

From Brighton to Newhaven the coast is composed of chalk cliffs, varying from 30 to 170 feet in height, the summits of which are clothed with verdure. The village of Rottingdean lies in one of the valleys about $1\frac{3}{4}$ miles S.E. by E. of the eastern part of Brighton; and on the western side of the downs adjoining Rottingdean is a large black mill, which is conspicuous from seaward. Burrow head—the eastern cliff on this range—is about 190 feet high, with a flagstaff upon it; the upper portion of the head is composed of earth, and the lower part chalk, but the wash from the earthy part gives its face a rusty appearance. Close to the eastward of Burrow head is the harbour of Newhaven.

The shore from Newhaven harbour to Seaford head is composed of low beach, on the western part of which stands a large yellow building, with wind-mill on top, known as Catt's tide mill; near the eastern part is the village of Seaford, conspicuous by its square tower church, and the spire of Blatchington church, which stands a little farther inland, also the martello tower on the beach near the low north-west point of Seaford head. The high land at the back of Seaford and Newhaven is a continuation of the range of hills from Beachy head, known as the South Downs.

Seaford Head, 290 feet high, is generally of a rusty white appearance, having a large green patch on its face near the top, by which it may be known from Beachy head, which has always a clean white face and is surmounted by a house. To the south-east of Seaford head is the valley of Cuckmere, where was formerly a haven for ships, but through which only a small stream now runs; and between this and Beachy head is a range of undulating cliffs, known as the Seven Sisters, which are distinctive features in the appearance of Beachy head when seen from the westward.

Dangers.—The principal dangers between the Owers and Beachy head are, the Bognor, the Shelley, the Winter, and the Jenny Ground rocks, which are close to the shore; also the Kingmere rocks, which lie about $4\frac{1}{2}$ miles from the coast between Little Hampton and Worthing.

A Life Boat is stationed at Worthing.

BOGNOR ROCKS form a high and dangerous ledge, extending in a south-east direction 1¾ miles from the shore a little westward of the town of Bognor: they dry some time before low water in large detached blocks of conglomerate or pudding stone, and are bold on their sea face. Their outer end, Bognor spit, is one mile from the shore, and dries at five hours ebb, with 13 to 17 feet water on its north-east side.

Marks.—The marks for the spit are, Pagham church and watch-house in line W. by N. ¾ N., and Felpham church open eastward of the two mills. Pagham church open south of Pagham watch-house N.W. by W. ½ W. leads one quarter of a mile south of the ledge, and Middleton church spire on with Arundel church turret (white) leads south-east of the spit.

Barn Rocks lie about one mile westward of the Bognor rocks, and uncover at low water; but as they are close inshore, are only dangerous for boats.

Anchorage.—The anchorage in-shore, on the north-east side of the Bognor rocks, is not recommended for general use, on account of there being no outlet if caught with south-east winds, which bring a heavy sea. It is however used by small coasters chartered for Felpham and Bognor, and might also be used by vessels of small draught when not able to get as far as the Park with strong westerly winds.

After rounding Bognor spit, steer for the shore to the westward of Felpham, and anchor when Pagham church opens north of the coast-guard houses; or when Bognor church tower is seen just westward of a large white house near the beach, and Arundel church tower opens westward of a large clump of trees.

MIDDLETON LEDGE is a low straggling ledge of rocks projecting a short distance outside the general line of low-water mark at spring tides, about midway between Felpham mills and Middleton church. Climping mill in line with the coast-guard staff at Elmer leads on them. The ledge extends in a S.S.E. direction, with 4 to 6 feet water over it towards the Shelley rocks, and between it and the Shelley is a passage of 11 feet water; but no vessel drawing more than 9 feet should navigate at low tide inshore of the Shelley or Winter rocks.

SHELLEY ROCKS lie 1¾ miles S.S.E. of Felpham mills, and have only 4 to 6 feet over them in detached patches. From the outer or south-east patch Middleton church spire is in line with the east end of a conspicuous long barn N.N.E. ¼ E.; and the middle chalk pit on Highdown hill is on with the left of the two Rustington mills.

Buoy.—A black conical buoy is placed on the south-east side of the rocks in 4 fathoms, with Arundel church tower on with coast-guard house at Elmer, N.E. ¼ N.; Chichester spire in line with Felpham station-house

N.W. by N.; and East bank buoy S.W. ½ S., $4\frac{7}{10}$ miles. Felpham mills, in line with Rooks hill N. by W., leads to the anchorage on the north-east side of the Bognor rocks, in a fairway between the Bognor spit and the Shelley rocks.

WINTER KNOLL is a small bank of chalk, with only 8 feet water on it, lying off the coast-guard station at Elmer, about S.W. by W. 2½ miles from Little Hampton lighthouse. From the shoalest spot of 8 feet Arundel church is in line with the middle of the eastern of two gaps in the park trees, N.N.E. ½ E.; and Cisebury hill appears over the top of Highdown hill, E. by N. ½ N.

Buoy.—A black can buoy is placed off the south side of this shoal, in 3 fathoms, with Dome house at Bognor its width north of Felpham black mill, N.W. ½ W.; Little Hampton pier lighthouse N.E. ½ E.; and Shelley buoy W. by N., distant 1¾ miles. Salvington mill in line with the chalk pit on Highdown hill E. by N. ¾ N. leads south of the knoll.

KINGMERE ROCKS lie 4½ miles off shore, S.S.W. from Highdown, and Preston church; and have from 4½ to 5½ fathoms water over them. They cover a space 2 miles long, N.W. by W. and S.E. by E., and are very narrow; between them and the flats which extend off shore there is a general depth of 5½ and 6 fathoms, with occasional patches of 3¾ fathoms.

Marks.—Chanctonbury grove open westward of Salvington mill, and Goring church (black spire) N.E. ¼ N., leads over their western end in 29 feet water, and Navarino mills between Lancing grove and mill N.E. ¾ E., leads over their eastern end in 33 feet; Chichester church spire over the north part of Felpham trees, leads over their north-western part in 29 feet, and to the southward of their eastern end in 7½ fathoms.

LITTLE HAMPTON.—Nearly 5 miles to the eastward of Bognor, and N.W. by W. ½ W., 28 miles from Beachy head light, is the entrance of the river Arun, between two piers 125 feet apart. The Western pier is carried out 200 yards farther than the eastern one, by which the beach and sand which works up from the westward is accumulated and prevented from washing into the entrance. In continuation of the east pier is a low dicker-work, which is carried above the level of the sands, and extends nearly out to low-water mark; this serves to guide the stream in a fairway out, so as to scour the entrance and carry the *débris* as far seaward as possible, to prevent the formation of a bar. A row of warping posts is driven into the sand at 20 feet eastward of the dicker-work; the outer three posts are outside the low work, the termination of which on both sides is marked by a bush beacon.*

* *See* Admiralty plan, entrance to the river Arun, No. 13; scale, $m = 5\frac{3}{4}$ inches.

The depths within the entrance at high-water springs are:—16 feet in the fairway off the warping posts, 15 feet abreast the bush beacon on the end of the low western work; 17 feet between the piers, 16 feet abreast the mill, and a general depth of 18 to 16 feet up to the ferry at the north-western part of the town of Little Hampton. A vessel drawing 13 or 14 feet water can proceed up to Arundel, there being a towing-path on the port-hand, and several berthing piles should she be obliged to stop for tide.

Little Hampton is about three quarters of a mile within the entrance of the Arun, and was the ancient haven of Arundel. On the western shore there is a ship yard, and a patent slip; the latter being 400 feet long, and capable of receiving a ship of 400 tons burthen, and of 10 feet draught. The number of vessels belonging to the port is 50, amounting to 6,693 tons.

LIGHTS.—A *fixed red* light is shown all night on the north end of the east pier at the entrance of the Arun. It is elevated 30 feet above high water, and visible in clear weather from a distance of 7 miles.

The following lights are placed on the south end of the east pier to show the depth of water, and when in line with the above *red* light bearing North lead to the entrance. A white light indicates 10 feet between the piers; a *green* light, 11 feet; a *red* light, 12 feet; a *red* and white light, perpendicular, 13 feet; two white lights, perpendicular, 14 feet; and a white and *green* light, perpendicular, 15 feet. These lights are extinguished at high water.

Anchorage.—Vessels drawing less than 10 feet will find good anchorage in the 2-fathom hole off Little Hampton, with the Outer warping post in one with the mill near the harbour N. ¾ E., and Cisebury hill opening southward of the crest of Highdown hill; or at one mile from the piers in 13 feet water, chalk and gravel, with Salvington mill in line with the chalk pit of Highdown.

If the vessel is of 17 feet draught, anchor with the entrance open about 1½ miles distant, and Chanctonbury grove over the western chalk pit on Highdown, in 19 or 20 feet water, chalk, stones, and gravel.

There is a position farther westward much approved of by the pilots, with Little Hampton church in line with the coast-guard houses east of the harbour mill, or the mill open west of the lighthouse; and the Winter buoy W. by N. distant one mile. Should a vessel require to anchor before going into the river, it would be advisable, if the wind be easterly, to anchor off Rustington mills, as the stream will set to the westward by the time there is water to enter.

Tides.—It is high water, full and change, at Little Hampton, at 11h. 36m.; springs rise 16 feet, neaps 11½ feet. The general depths over the bar are 14½ to 15¼ feet at high-water springs, and 9½ to 11 feet at

neaps. It is high water at Arundel at 0h. 25m. The stream in the river depends upon the state of the country; thus, after heavy rains there will be a constant downward current.

The flood runs with great strength until one hour after high water; but immediately outside the eastern pier-head, from half flood to half ebb, it sets strongly to the westward, and this must be carefully attended to, when going in or out in order to avoid the western jetty work.

The tidal signals are made from a single staff near the lighthouse. They are exactly similar to those used at Shoreham, page 233, and give the depth in feet at the entrance.

Directions.—Approach the entrance of the Arun with the outer warping post in one with the lighthouse bearing North, and keep about a ship's length westward of the outer posts, taking care to be to the westward of the bush on the end of the low work and to make allowance for the stream which sets about 2½ knots to the westward at half tide, and strong (nearly 6 knots) up the harbour between the piers. After passing Mussel row, the tide slackens, and when near the berthing place it is customary to let go the anchor and warp into a berth. Pilots are always in attendance and provided with fine boats, so that the weather must be bad when they cannot come off.

Grass Banks, which extend along the coast off Worthing, are so named from the great quantity of long grass that grows on the chalk and gravelly soil of which the bottom is composed. They have as little as 9 feet over them at 1½ miles from the shore, and their most projecting part, named the Elbow, bears S.S.E. from Navarino mills and S.S.W. from Lancing grove, and their eastern side terminates about one mile westward of the black coast-guard buildings at Shoreham.

When sailing along shore from the eastward keep the lead going, and do not stand nearer the Elbow than to have Portslade mill coming on with Shoreham piers—the mill on with the low lighthouse at Shoreham leads outside the Elbow in 12 feet at low water. When Lancing grove is in one with the coast-guard houses N.N.E., a course more to the northward may be kept; but when working to windward the lead is by far the best guide.

SHOREHAM HARBOUR offers considerable advantages to wind-bound vessels to run for shelter at a proper time of tide, being about midway between the Isle of Wight and Dungeness. From recent improvements it is capable of taking vessels of considerable burthen at all tides at high water, the entrance being wide, with a depth at high-water springs of 21 feet between the piers, and in the harbour at high-water neaps

15 feet.* Fronting the entrance is a shifting bar, which dries 2 feet. In 1876 this bar was at a distance of two-thirds of a cable from pier heads.

The harbour is formed by the outset of the river Adur, which flows through the beach between two piers, 176 feet apart, which form the entrance. Within these piers a third or middle pier is built out from the shore, for the purpose of directing the waters on the ebb directly to the entrance, and it divides the harbour into two parts, named the eastern and western arms. The western arm is the natural one formed by the course of the river; the eastern arm is partly artificial and partly formed by the original course of the river, which then emptied itself into the sea one mile eastward of the present entrance. There is a patent slip in the western arm capable of receiving a vessel of 600 to 700 tons burthen.

The western arm has 20 feet in it at high-water springs, and 15 feet at high-water neaps. There are good wharves, which are chiefly used by colliers and timber-laden ships. The bed of the river between the wharves and the town is uneven and hard; at the town the bed is 5 feet above the level of low-water ordinary springs. At the custom-house quay there are 11½ feet at high-water springs.

The eastern arm, between the middle pier and the entrance lock of the floating canal, has 17 feet in it at high-water springs, and 13 feet at neaps. The canal is 1½ miles long, and has 3 to 14 feet water in it at high-water neaps. The lock is 175 feet long, 33 feet wide, and the sills have 21½ feet over them at high and 4 feet at low water springs; and 16 feet at high and 8 feet at low water neaps. Vessels drawing 16 feet can lie afloat inside the lock.

A groyne or breakwater is constructed near the west side of the western pier, for the purpose of diverting the travelling shingle from forming a bar at the entrance; and vessels taking the harbour must be careful not to mistake the end of this breakwater for the western pier head.

The total number of sailing vessels belonging to the port in 1879 was 129, and their tonnage 23,040 tons; also 12 steam-vessels. In the same year 766 vessels of an aggregate tonnage of 86,068 tons entered. The population of the parish of New Shoreham is about 4,000.

LIGHTS.—Two lights are exhibited at 42 and 23 feet respectively above high water, from the lighthouses within the entrance of harbour; they bear N. by E. ½ E. and S. by W. ½ W. from each other, and are 250 yards apart. The high lighthouse, of gray stone and 38 feet high, stands on the shore, and exhibits, from sunset to sunrise, a *fixed* white light visible at 10 miles. The low lighthouse, built of wood and painted white, stands near the apex of the middle pier, and also exhibits a *fixed* white light

* *See* Admiralty plan, Shoreham harbour, No. 12; scale, $m = 6$ inches.

during the time when there is a depth of more than 11 feet water on the tide gauge at the middle pier; the light shows *green* when there is from 8 to 11 feet with a flowing tide; and *red* when it is high-water slack tide.

On the low lighthouse is a flagstaff, on which a red flag is hoisted during the day, when a vessel drawing 11 feet can enter the harbour with safety, and at high-water slack it is hauled half-staff down. For signals see page 233.

On the outer extremities of East and West piers are exhibited two fixed *green* lights.

Church Rocks lie half a mile westward of the black coast-guard buildings, at Shoreham, or two-thirds of the way from them towards the groynes on the beach, and one third of a mile off shore; they have 3 feet water on them, but they have been seen dry by some of the inhabitants of Shoreham. The marks for the rocks are, the cement chimney in one with the roof of Shoreham church, and Lancing mill over the two easternmost groynes on the beach. Fishers-gate mill (circular and gray) in line with end of western groyne bearing East, leads to the southward in 14 feet water.

Jenny Ground is a cluster of Chalk rocks, with 5 to 7 feet water, extending half a mile off shore abreast the Brighton and Hove gas-works. The marks for the outer part of 7 feet water are, Portslade mill, N. by E. ½ E., and Shoreham church shut over the piers. Shoreham church in line with end of western groyne, bearing N.W. ¼ W., leads to the southward.

Anchorage.—A vessel may anchor in any convenient depth off New Shoreham, from one third of a mile off the harbour in 16 feet, to one mile in 24 feet, over sand and gravel with patches of chalk, or westward of the Jenny Ground rocks, with outer end of western groyne, bearing N. by W., a mile distant, in 3½ fathoms, sand, shells, and mud. Should it be necessary to wait any length of time for sufficient water to go into the harbour, anchor off the black coast-guard buildings, with Shoreham church bearing North, and Portslade mill between the low lighthouse and the pier heads, in 3½ fathoms. This anchorage is sheltered from westerly winds by the shallows off Worthing, and has the advantage of having an easy stream on the flood.

Tides and Tidal Signals.—It is high water, full and change, in Shoreham harbour, at 11h. 34m.; springs rise 18 feet, neaps 13¼ feet. The stream on both tides runs with great force between the piers, often as much as 6 knots; on the flood it is split by the middle pier, and its force diminished in each arm.

Near the low lighthouse on the middle pier is a flagstaff and yard, on

which the following tidal signals are made with black balls two feet in diameter and a blue and white pendant.*

SIGNALS.	SIGNIFICATION.
A single ball at masthead - -	General answer or acknowledgment.
Two balls „ „ - -	There is 8 feet water at the gauge on middle pier, with flowing tide.
Three balls „ „ - - -	- 9 „ „ „
One ball at outer yard arm - -	- 10 „ „ „
Two balls „ „ - -	- 11 „ „ „
Three balls „ „ - -	- 12 „ „ „
One ball at inner yard arm - -	- 13 „ „ „
Two balls „ „ - -	- 14 „ „ „
Three balls „ „ - -	- 15 „ „ „
A single ball at each yard arm - -	- 16 „ „ „
A pendant at masthead - - -	It is now slack tide.
„ and one ball under at masthead.	There is 16 feet at the gauge at middle pier, with an ebbing tide.
„ and two balls under at masthead.	- 15 „ „ „
„ at masthead, and one ball at outer yard arm.	- 14 „ „ „
„ and two balls at ditto -	- 13 „ „ „
„ and three balls at ditto -	- 12 „ „ „
„ and one ball at inner yard arm.	- 11 „ „ „
„ and two balls at ditto -	- 10 „ „ „
„ and three balls at ditto -	- 9 „ „ „
„ at outer yard arm - -	- 8 „ „ „
„ and one ball under at ditto -	There is not water enough on bar.
„ and two balls under at ditto	Keep eastward.
„ between two balls at ditto -	Keep westward.
„ under one ball at ditto -	The signal cannot be made out, the flag is foul or hid by upper sails.
„ under two balls at ditto -	The depth of water will be shown at every foot rise or fall.
„ at inner yard arm - -	Assistance will be sent immediately.
„ with one ball under at ditto	Pilots cannot get to sea.
„ with two balls under at ditto	Pilots will be sent when a boat can pass the bar.
One ball with pendant under, at inner yard arm.	Pilots are all engaged, but one will be sent as soon as possible.
Two balls ditto ditto	The owner wishes his vessel to bear up for shelter.
„ at outer and one ball at inner yard arm.	The owner does not wish his vessel to risk the bar
One ball at outer and two balls at inner yard arm.	Pilots will be on the pier, if the vessel attempts the bar the depth of water will be shown.
Two balls at masthead, and one ball at outer yard arm.	It appears a vessel might stem the tide.
Ditto ditto inner yard arm - -	The tide runs so strong that a vessel may not be able to stem the tide.
One ball at masthead, with pendant under.	The tide is ebbing.
Two balls ditto ditto - -	The tide is flowing.

Directions.—Vessels bound to Shoreham from the westward, after passing Worthing, will open a deep valley, having on its east side Shoreham church, which may be seen some distance at sea; it has a square tower, its roof appears white, and it stands about one mile westward of the piers. Approaching from the eastward, the Jenny Ground rocks will be avoided by keeping Shoreham church (St. Mary) in line with outer end of Western groyne, N.W. ¼ W.; at night do not approach the shore within the depth of 5 fathoms at low tide, until the high light bears N.N.W.

Vessels turning to windward from the eastward, between Newhaven and Shoreham, will, by keeping inshore, find a stream setting to the westward nearly 2 hours before it is high water on the shore, and by making short

* The same tidal signals are used at Little Hampton.

tacks, they will get to the westward before the offing stream has made down channel.

As the tides run strong at the entrance to the harbour, the best time to enter is at high-water slack. Keep the high leading light (white) just open eastward of the western pier green light, to pass westward of the shifting bar, and when clear of the western groyne bring the leading lights in line. Attention should be paid to the set of the tide; and when inside the outer piers borrow on whichever side or arm the vessel is bound to, to avoid being set by the stream against the middle pier, where some serious accidents have occurred. In the western arm, buoys are moored abreast the wharves, on the top edge of a steep bank, and it is customary to make fast to a buoy, or run the vessel's fore foot on the bank, or drop the anchor and let the flood stream swing her stern round, and then warp into a berth.

A Life Boat is stationed at Shoreham.

BRIGHTON.—The centre of this fashionable watering place is about 4½ miles S.E. by E. ½ E. from Shoreham. The houses fronting the sea present an almost continuous line of handsome buildings for a distance of 3 miles; and though no manufactures are carried on the prosperity of the town may be estimated from the fact that in half a century the population has been quadrupled. In 1871 the population amounted to 103,760.

Pier Lights.—A magnificent pier, lately constructed, extends 1,115 feet into the sea, and at its head, which is 140 feet broad, is displayed a *fixed red* light, which should be visible in clear weather from a distance of 5 miles.

One mile to the eastward of the above pier is the old chain pier, which extends 1,100 feet from high-water mark, and at its outer end, from an elevation of 35 feet, is exhibited a *fixed green* light, which should be visible from a distance of 5 miles.

Tides.—It is high water, full and change, at Brighton, at 11h. 15m.; springs rise 19¾ feet, neaps 16 feet. As before stated, the stream inshore sets to the westward about two hours before it is high water by the shore.

At the new pier end there is a depth of 27 feet at high-water springs, and 23 feet at neaps. As the springs rise 19¾ feet and neaps 16 feet, a vessel drawing about 10 feet might go alongside at half flood, if the water were quite smooth.

A Life Boat is stationed at Brighton.

BLACK ROCK LEDGE extends one quarter of a mile from the cliffs at low-water springs, off the eastern part of the town of Brighton,

abreast the Black rock coast-guard station. The ground is shoal for one-quarter of a mile outside the ledge, which must be approached with caution when the tide is low.

Marks.—Beachy head lighthouse open of Seaford cliff leads outside the shallows in 3 fathoms, and when the tide flows over the ledge it is difficult to estimate the distance off shore; but the pier end shut in with the western houses in Brighton will clear the dry part of the ledge, about one cable.

The whole of the coast between Brighton and Newhaven is studded with chalk rocks in detached patches on a sandy strand, but the depths alongshore are regular. Beachy head light just shut in by Seaford cliff will lead outside all the patches in depths varying from 8 to 14 feet, and if kept one quarter of a point open, it makes a good working mark; the best guide however is the lead.

Fricker Rocks are detached from the low-water rocks off Burrow head and uncover 10 feet at low water. They lie nearly 1½ cables off the cliffs, and afford shelter to the entrance of Newhaven harbour, from which they are distant one quarter of a mile. These and the shallows off the harbour are cleared in 16 feet water by keeping Blatchington church spire, over the low cliffs, between the Buckle inn and the long row of white coastguard buildings near the battery.

NEWHAVEN HARBOUR, lying about midway between Spithead and the Downs, and in the fair track of vessels working up or down channel, is the best tidal harbour between Portsmouth and Ramsgate, having a 20 feet rise of tide, and a powerful backwater. The entrance is in the north-west extreme of Seaford bay, close to the eastward of Burrow head, the last of the range of chalk cliffs eastward of Brighton.

The harbour is formed at the entrance of the river Ouse by conducting the channel of that river into the sea in a southerly direction from the town of Newhaven, which stands on its right bank nearly one mile above the pier heads. At the town there is a swing bridge to allow vessels of 36 feet beam to pass through when bound to Lewes, the river being navigable to that place for small coal brigs. Above the bridge there is a ship yard for building and repairing ships. In 1879, there belonged to the port 22 sailing vessels, representing 2,507 tons, and 14 steam-vessels representing 2,589 tons. During the same year, 989 vessels of an aggregate tonnage of 206,690 tons entered the port. The population of the town is about 1,800.*

The piers at the entrance are 150 feet apart, and are constructed of strong wood piles carried out in a southerly direction across the beach.

* *See* Admiralty plan, Newhaven harbour, No. 2,154; scale, $m = 18$ inches.

The western pier is about 220 yards long, and the eastern pier about 190 yards, the inner end of the latter being in line with the high ridge of beach above high-water mark. A new pier has been built on the eastern side, and the old pier on that side is in course of removal; when this work is completed the piers at the entrance will be 250 feet apart. On the western side, the western pier is continued up the harbour by a well-built stone embankment, which terminates at the sea wall near the watch-house opposite the railway hotel.

Two wooden lighthouses of unequal height stand on the western pier, and one painted stone colour on the eastern pier. Near the hotel there is a good wharf, whence steamers run to Dieppe and Jersey. There is also a strong gridiron, capable of taking a vessel of 600 tons burthen, and 200 feet long. On the western shore, from the watch-house to the bridge, are twenty sets of berthing piles, alongside which vessels ground on soft mud.

A high groyne or breakwater has been extended in a S.S.W. ½ W. direction, at a short distance westward of the west pier, to accumulate the shingle and prevent its forming on the bar, which before was so detrimental to the harbour; it also splits the sea in strong westerly gales, so that vessels enter easily between the piers. At about 400 yards to the westward of the west pier a breakwater in course of construction extends in a south-easterly direction from the shore. A red bell buoy is placed near the extremity of the works in progress.*

Bar.—The bar is formed of compact shingle or pudding stone, which runs across the entrance at 250 feet outside the piers, and in November 1882 had a depth of 4 feet at low-water ordinary springs. Thence a flat extends seaward, there being a depth of 6 feet about 1¾ cables from the pier heads.

Between the entrance piers there is 8 feet water, and thence to the custom house a central channel, having a depth of 10 feet, has been dredged. There is now a depth of 5 feet alongside the quays and berthing stages.†

Signals.—The depths over the bar are indicated by the signals made from the flagstaff on the western pier by day, and by the lights at night, but in crossing it will be necessary to allow for the heave of the sea.

For 8 to 10 feet water over the bar one black ball is hoisted on the flag-staff, and for 10 to 13 feet two black balls. At 13 feet the balls are lowered and a red flag is hoisted; and at 15 feet and upwards a red flag and one black ball are shown.

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* This breakwater when completed will be 1,000 yards long, and its extremity will bear south about 800 yards from the west (entrance) pier head.

† Dredging operations are still in progress, and it is intended to dredge the central channel to a depth of 12 feet.

LIGHTS.—Two *fixed* lights, 28 and 17 feet respectively, above high water, are exhibited from two wooden lighthouses, about 90 yards apart, on the western pier at Newhaven, and when in line bear North and South. The high light is *white*, and shown all night; the low light shows *red* when there are between 10 and 13 feet water on the bar; shows *white* when there are between 13 and 15 feet; and shows *green* when there is a depth of 15 feet and upwards. The high light should be seen from a distance of 10 miles.

To assist vessels entering between the piers, a *fixed green* light is shown all night from the lighthouse on the eastern pier. The light is elevated 18 feet above high water, and visible at 3 miles.

Tides.—It is high water, full and change, at Newhaven, at 11h. 51m. springs rise 20 feet, neaps 15 feet. About 1½ hours before high water, the stream begins to set to the westward close in shore, but is so weak across the harbour entrance that it is of no consequence excepting to a sailing vessel with a light wind. Between the piers the stream, being contracted, runs about 2½ knots on both tides, diminishing in force as the harbour widens.

Directions.—When coming from Beachy head towards Newhaven, observe the rocks of Crowlink (1¼ miles westward of the lighthouse), and if they are awash or covered, it will indicate a depth of 10 feet water and upwards over the bar.* Run towards Burrow head, and when nearing the piers bring them to bear North with the harbour open, and passing eastward of the red buoy which marks the extremity of the breakwater works (in progress), steer between the piers, whence a mid-channel course should be steered up the harbour. When far enough up, anchor or run out a warp to the berthing piles or stage, and drop into a berth.

At night observe the depths by the lights, and run in with them in line bearing North until well up to the western pier, when open the harbour and proceed up between the piers.

On the strength of the ebb, the harbour is by no means easy of access, and formerly the signals were never shown on the falling tide; but since the passage steamers have used the harbour it has been deemed necessary to have signals as long as there is water enough for them to cross the bar. The gaslights at Brighton greatly assist in making the entrance at night.

A Life Boat is stationed at Newhaven.

SEAFORD ROAD.—Between Shoreham and Beachy head the soundings gradually decrease from the offing towards the land, and vessels may anchor all along the coast with off-shore winds in from 4 to 9 fathoms; but the anchorage of most general resort is that in Seaford road, between

* The bar and channel are in process of being dredged, *see* page 236.

[illegible] the mill which stands on the shore eastward of Newhaven, and the martello tower on the beach at Seaford. The best anchorage in the road is between this tower and Bishopstone battery, with Beachy head lighthouse just seen over the cliffs, in about 7 fathoms, over a bottom of sand, shells, and mud. In this position Beachy head cliffs will afford shelter with the wind as far southerly as E.S.E., and it is therefore superior to the West bay of [illegible].

Seaford Head is often mistaken for Beachy head by vessels coming up Channel when within [illegible] or [illegible] miles of the land; they may however be distinguished by there being a small building on the highest part of Beachy head, whereas there is nothing on the former but a large and conspicuous green patch on the face of the cliff. Some straggling chalk rocks, named the [illegible], with [illegible] feet water on them, lie one quarter of a mile off the low north-west end of Seaford head, with Bishopstone church spire and mill just open eastward of the martello tower on Seaford beach. Newhaven mill on with the pier heads, or Crowlink coast-guard houses open of the south-east cliff of Seaford head, leads to the southward in [illegible] fathoms.

BEACHY HEAD.—This promontory, 550 feet high, bearing E. [illegible] S. [illegible] miles from Owers light-vessel, is rendered strikingly remarkable when seen from the westward by the uniform convexity in the profile of its seven white cliffs, generally called the Seven Sisters; when seen [illegible] miles distant in an E.S.E. direction, it makes like an island, the left side being chalk cliffs, with a house on it, and the middle and right side covered with verdure, terminating in the fall of the South downs.

LIGHT.—Beachy head lighthouse, 47 feet high and coloured white, stands on a cliff 242 feet above high water named Belle Toute, near the summit of the second cliff westward of the head. It exhibits a white light, which *revolves* once in *every two minutes*; its brilliancy being of 15 *seconds* duration, and its darkness *one minute and 45 seconds*. The light is elevated 285 feet above high water, and is visible in clear weather from a distance of 23 miles.

Coming from the eastward, the light will open of the head on a N.W. by W. bearing, and by keeping it so, will lead 1¼ miles outside Southern head of the Royal Sovereign shoals. These shoals are now marked by a light vessel. *See* page 239.

The Coast from Beachy head towards Pevensey trends deeply inwards and the land here is but little above the level of the sea; towards Hastings it again becomes elevated, and the land appears double, rising high in the interior. Between Beachy head and Hastings the strand, on which are a great number of martello towers, is composed of coarse shingle studded here and there with small rocky heads, particularly in the vicinity of

Hastings and Cliffs-end point. Fairlight down is the highest land hereabouts, being 626 feet above high water, and often the first landfall made by vessels homeward bound. It may always be known by the church—which has a square stone tower built near the summit, 597 feet above high water. The summit of the down is green pasture land, and the face of the cliff a gray sandstone.

ROYAL SOVEREIGN SHOALS are a number of rocky banks lying directly in the track of vessels proceeding between Beachy head and Dungeness. The principal are known as, the Royal Sovereign, Southern head, Horse of Willingdon, Elphic Tree, and Long Shoal. There are strong ripplings over the shoals during spring tides, and in bad weather the sea breaks heavily upon them.

The Royal Sovereign, so called from H.M. ship of that name having grounded on it in 1756, is composed of sandstone rocks, and has only 9 feet on its shoalest part at low water, from which the signal house on Beachy head bears W. by N. $\frac{1}{4}$ N., distant 6$\frac{1}{2}$ miles; the first tower standing eastward of the Grand redoubt at Eastbourne is in one with the western edge of Willingdon chalk-pit, N.W.; and Fairlight church is open of Hastings castle cliff, N.E. by E. $\frac{3}{4}$ E.

Buoy.—A conical buoy, striped black and white vertically, with staff and cage, is moored half a cable southward of the 9-feet patch, with the following marks:—The first martello tower eastward of Eastbourne in line with the west side of Willingdon chalk-pit, N.W. $\frac{1}{4}$ W.; the white mill north of Bexhill a little open westward of the third martello tower west of Bexhill cliff N.N.E. $\frac{1}{2}$ E.; Fairlight church open southward of Hastings castle cliff, N.E. by E. $\frac{3}{4}$ E.; and Beachy head, W. by N. $\frac{1}{2}$ N.

The Southern Head is a small narrow ridge, about one-third of a mile long, N. by E. and S. by W., with 25 feet water, lying S. by W. 1$\frac{1}{3}$ miles from the Royal Sovereign shoal. From the shoalest part, Beachy head signal house bears N.W. by W. $\frac{3}{4}$ W., distant 7 miles, and Hankham mill is in line with the eighth tower eastward of Eastbourne, or the fourth from Langley fort, N. by W. $\frac{3}{4}$ W.

Close to the southern edge of this shoal there are 8 fathoms water, to the eastward 11 fathoms, and between it and the Royal Sovereign 5 to 10 fathoms. There are 10 fathoms at half a mile to the southward of it, and at one mile in the same direction Beachy head light will open out, bearing N.W. by W., which at night leads southward of all the shoals.

LIGHT VESSEL.—A light-vessel is moored in 12 fathoms at low-water springs, three-quarters of a mile to the southward of the Southern head; and exhibits at an elevation of 36 feet above the level of the sea, a *flashing white* light giving *three flashes* in quick succession, *every*

minute; the time occupied by the exhibition of these flashes is about *twenty-three seconds*, and the interval of obscurity between each successive three flashes is *thirty-seven seconds*. From the light-vessel the lighthouse cliff just open of Beachy head bears N.W. by W. ½ W., Langley point fort N.N.W. ¼ W. $6\frac{4}{5}$ miles, Royal Sovereign buoy North (westerly) 2 miles, Dungeness point E. by N. $23\frac{4}{10}$ miles.

The vessel is distinguished in the day-time by a small ball over the usual one at her mast head, and the words *Royal Sovereign* are painted on her sides. During foggy weather a gong is sounded. A gun is fired if a vessel be seen standing into danger.*

The Horse of Willingdon, consisting of stone and rock, lies N.W. by W. ½ W. 2 miles from the Royal Sovereign buoy, and from its shoalest spot, with 3 fathoms water, Hankham mill is just seen westward of the third tower from Langley fort, or the seventh tower from Eastbourne, N. by W., and Beachy head signal-house bears W. by N. $4\frac{3}{4}$ miles. There are strong ripplings over this shoal.

The Elphick Tree is a small shoal patch of 30 feet water lying about three-quarters of a mile north-west of the shoalest part of the Horse of Willingdon; and between it and the shore, about $1\frac{1}{4}$ miles from Langley fort, is a small rocky spot of 4 fathoms, from which the fort is in one with Hankham mill and the three mills at Eastbourne are just open southward of the coast-guard staff, near the Redoubt.

The Long Shoal is a narrow bank of 18 to 22 feet water, about one mile in length in a W. by S. direction, lying a little to the northward of the Royal Sovereign shoal. A smaller patch, named Kinsmans Nab, of only 22 feet water, nearly joins its western edge: the marks for which are, Willingdon chalk-pit on with the first tower, and Hankham mill just open east of the eighth tower eastward of Eastbourne.

DIRECTIONS.—Since the establishment of a light-vessel near Southern head of Royal Sovereign shoals there is no difficulty in rounding Beachy head; and vessels from the westward may steer to pass about a mile south of the light-vessel, and when abreast of her steer E. ¾ N. for a position about 2 miles off Dungeness. *See* general directions, p. 24. But in the event of the light-vessel being adrift, the following directions will be useful:—Rounding Beachy head from the westward, Seaford cliff kept just in sight to the southward of the pitch of Beachy head will lead at least 2 miles south of the Southern head; and when the two high white mills at Battle come in line with the town of Bexhill, about N.N.E., the vessel will be eastward of the Royal Sovereign shoals,

* For light-vessels' riding lights and signals, *see* page 26.

and may haul up about E. ¾ N. for Dungeness. The highest part of Fairlight down on with Hastings east cliff will lead one quarter of a mile eastward of the Southern head, and to the eastward of all the shoals.

At night, vessels coming from the eastward will open Beachy head light to the southward of the pitch of the head, on a N.W. by W. bearing; and whether bound up or down channel, when eastward of the head, and within 9 miles of it, by keeping the light open they will pass south of the Royal Sovereign shoals. *See* remarks on tidal streams, page 272.

From Hastings a vessel may pass north of the Royal Sovereign shoals by keeping the highest part of Fairlight down on with the east end of St. Leonards, near St. Leonards gate; but if bound south of the shoals from Dungeness, do not steer westward of W. by S. before Beachy head lighthouse or Seaford cliffs opens out.

Small vessels should not approach too near Beachy head when rounding it, as the Head ledge, a long narrow ridge of sandstone, extends from its south-east pitch in a S. by W. direction half a mile from the signal house. When rounding from the westward, they should keep the lighthouse well open south of the head; and in rounding from the eastward, the new church at Eastbourne open east of Wish Tower cliff; but in bad weather an offing should be kept of 2 miles outside the strong ripplings and heavy broken sea, which extends about 1½ miles off shore, and which is caused by a narrow ridge of rocks running out S.S.W. from the signal-house. There are less than 10 fathoms water on them, 13 fathoms to the westward, and a hole of 17 fathoms to the eastward.

EASTBOURNE BAY affords good shelter with the wind to the northward of West or N.E. by E., in 3½ fathoms, sand, abreast the Grand redoubt, with Willingdon church spire open west of the redoubt, and the towers to the northward of Langley point just opening east.

Light.—A *green* light is exhibited from the end of the new pier at Eastbourne and should be seen in clear weather from a distance of 2 miles.

Life Boat.—A life boat is stationed at Eastbourne, which is also a coast-guard station.

Holywell Bank.—A ledge, composed of large loose rocks, and which dries one foot at low water, lies one quarter of a mile off Wish tower which stands on the sandstone cliff to the south-east of Eastbourne. The long mark for the ledge is the square tower of Westham church, in line with the eastern edge of the Grand redoubt; but a vessel to tack clear of it must have the church half way between the redoubt and the first tower to the eastward. A ridge of sand runs from this ledge in a S.W. ½ W. direction nearly parallel with the coast, and terminates to the south-east in

Holywell bank, half a mile eastward of Beachy head ledge. The bank carries a depth of 8 to 12 feet, with 14 to 17 feet in a narrow gut named Whitbread hole between it and the shore.

Westham church open east of the Grand redoubt, leads eastward of the Holywell; and the little spire of Hurstmonceaux church in one with the western part of Westham church, or Hankham mill in one with the battery houses on Langley point, leads between it and the Royal Sovereign shoals.

Holywell Ledge is a ridge of high sandstone rocks commencing abreast the chalk cliff to the south-west of Wish tower, and terminating a little below the lime quarries. A large sandy flat extends along shore between it and the cliffs, on which vessels ground to load with lime, and are protected by the ledge from the break of the sea.

PEVENSEY BAY is between Langley point and Walls-end houses, and with the wind to the northward of W.S.W. affords good anchorage for small vessels, over sand and mud. They should bring up abreast the third tower northward of Langley point, with Beachy head signal-house just open of Langley point, or Pevensey church or castle bearing North.

Pevensey shoal, with $2\frac{3}{4}$ fathoms, is an isolated patch lying about midway between the Royal Sovereign shoal and the shore in a N.N.E. $\frac{1}{2}$ E. direction, and has 5 and 6 fathoms close to and around it. From the shoal Beachy head bears W. $\frac{1}{2}$ S., and the coast-guard house at the east end of Pevensey bay N. by W. Between Pevensey and Royal Sovereign shoals are some patches with $4\frac{1}{2}$ and $4\frac{3}{4}$ fathoms water.

Bexhill stands on the first rising ground westward of St. Leonards, and is conspicuous from seaward, having on the summit amongst the trees a church with a low tower, whilst to the westward of it is a remarkable white house.

Off Galley hill, which is the nearest cliff eastward of Bexhill, and the second westward of St. Leonards, are several rocks 2 or 3 feet above water; and a little westward of these, at one third of a mile off shore, between the bearings of S. by E. and S.S.W. from Bexhill church, are several rocks awash, named Bexhill reef, having 6 feet water between them and the shore. The highest part of Fairlight down over the west end of St. Leonards leads south of them in 7 feet at low water.

To the westward of Galley hill, off Nos. 4, 5, and 6 towers, and one third of a mile from the shore, a reef named the Oyster dries in several spots at low tides; this, as well as Bexhill reef will be avoided by not going north of the line of Willingdon chalk-pit on with the first tower eastward of Walls-end houses.

No good anchorage will be found between Galley hill and the sluice houses to the westward, as the ground is foul, and several rocky patches named the Coxheath shoals, with 8 to 12 feet water over them, lie half a mile outside the Oyster reef, and nearly one mile to the southward of the fifth tower (No. 50) west of Galley hill. Willingdon chalk pit on with the second tower to the westward of Walls-end houses, or the highest part of Fairlight down over the west end of St. Leonards, leads south of all the foul ground between Bexhill and the sluice houses.

HASTINGS is between Bexhill and Fairlight, immediately to the westward of the sandstone cliffs, the greater part of the town being built in the valley between East hill, or Rock-a-nor point, and West hill, on which stands the ruins of an old castle and three conspicuous windmills. St. Leonards is the continuation of Hastings in a westerly direction, and consists of well-built terraces.

The principal maritime importance of Hastings is its fishery, which employs a considerable number of boats. The anchorage off the town is only used by vessels having to discharge a cargo on the beach, or to wait a tide, it being too open for safety ; for with the wind to the southward of West, a heavy sea rolls in on the coast. They usually bring up with Fairlight high coast-guard house well open of the cliff. Several rocky ledges extend some distance from the shore, and are dangerous to vessels when covered ; but the brow of the high land some distance to the northward of Beachy head (Firle beacon hill) kept on with or a little south of Galley hill martello tower will lead to the southward.

Hastings Shoal, with 15 feet water on it, lies S. by E. 9 cables from Hastings pier; the eastern martello tower, No. 31 near Winchelsea, kept open to the southward of Fairlight cliffs leads to the southward of the shoal.

Fairlight Knoll is a small shoal with 18 feet on it, lying on the 4-fathom sand ridge, 2½ miles from Fairlight cliffs, and 3½ miles S.E. of Hastings. The western martello tower No. 34 in line with Playden church leads to the eastward of the knoll.

Vessels of 16 feet draught may stand over this ridge in smooth water and tack in shore, but vessels of heavy draught must be careful of doing so at low water.

LIGHTS.—The shore at Hastings being flat and rocky, it makes a bad beaching place for boats; the best, however, is abreast the fish market, near the eastern part of the town, and for the guidance and safety of the fishermen, in running on shore, two *fixed* lights have been established on a N.N.E. and S.S.W. bearing, 300 yards apart. The upper light, *white*, is shown at 60 feet above high water from the side of West hill over the

houses in the town ; and the lower light, *red*, at 30 feet from an octagonal building near the fish market on the beach. The high light should be visible in clear weather from a distance of 4 miles.

A *green* light is exhibited at 50 yards within the end of the pier, and in clear weather should be visible from a distance of 2 miles.

Boulder Banks lying abreast the martello towers, and on the eastern side of Fairlight hills, between Fairlight and Rye, about 1½ miles off the coast, are broken shoals of gravel and sand having a depth of 15 feet and 16 feet. Bexhill just open south of St. Leonards, leads to the southward of the shoals ; and Playden church spire in line with the steeple of Rye church, leads well to the eastward, but among small patches of 18 feet.

Tower Knoll lies between the Boulder banks and the shore, one mile from the beach, and has 10 feet on its shoalest part from which the eastern martello tower No. 31, Winchelsea castle, and the eastern houses of the town of Rye are in line.

RYE HARBOUR is formed in the channel of the river Rother, at the point where it enters the sea after receiving the waters of the Tillingham and Brede, two small rivers which unite with it near the town of Rye. The harbour is chiefly used by coasters and fishing vessels, and being difficult of access, the services of a pilot are indispensable. A steam tug is always in readiness, and the signal for her is a wheft at the peak, or burgee at the main.

The number of vessels belonging to Rye in 1879 was 91, total tonnage 6,179 tons. During the same year, 272 vessels, of an aggregate tonnage 22,217, entered the port. In addition to the above, about 100 vessels entered the harbour windbound, and did not discharge their cargoes.

The principal imports are timber, oilcake, coal, and soda. The exports, oak timber, bark, and flints. There is a patent slip, on which vessels of 90 feet keel and 300 tons burthen have been hove up for repairs at ordinary springs. The population of the town in 1871 amounted to 8,288.

LIGHTS.—Two *fixed* white lights, 850 yards apart, are exhibited from the east pier of Rye harbour. The lights are visible from a distance of about 3 miles, and, when in line bearing N. by W., lead over the sand in front of the harbour, in the same water that the harbour signals indicate.

The lower white light, 12 feet above high water, is shown from a pole near the outer end of the east pier, and is lighted when the flood tide makes and kept burning until half ebb.

The upper white light, 25 feet above high water, is lighted when there is a depth of 10 feet, and extinguished at 10 feet on the ebb.

A *red* light, 12 feet above high water, is also shown from a mast on the extremity of the west groyne when the water is rising, and is extinguished at half ebb.

Life Boats.—A life boat is stationed at Hastings, Winchelsea, and Rye.

Tides and Tidal Signals.—It is high water, full and change, in Rye bay, at 11h. 20m.; springs rise 22 feet, neaps 17¼ feet. The springs rise at the point 16 feet, at the town 12½ feet, and at the float sluice 11½ feet. The depth in the harbour at high-water springs is 15 and 16 feet, at neaps 10 and 11 feet. The flood runs in round the beach with a velocity of 6 knots, but its rate lessens inside. It would not be prudent to leave the harbour during the strength of the tide, but wait till it slackens, about half an hour before high water.

The Telegraph at the entrance of the harbour, near the flagstaff, shows the flowing of the tide. The frame and shutters are black and when not in use hang vertical, and appear all black; when in use the shutters are canted horizontally, so as to show a circle of light through the frame and are worked as follows:—When there are 8 feet water one shutter is canted; when 9 feet both shutters are canted; when 10 feet a red ball is hoisted; when 11 feet, the red ball is shown, and one shutter is canted; when 12 feet the red ball with both shutters are canted. So that the shutters without the red ball denote under 10 feet, and with the red ball above 10 feet.

When there is a depth of 13 feet, the red ball, both shutters, and a black ball on yard arm; when 14 feet, the red ball and two black balls; when 15 feet, the red ball and three black balls; and with 16 feet, the high-water blue flag is hoisted under the red ball and four black balls are shown at the yard arms.

A black ball is hoisted on the ball-pole, at the harbour flagstaff, in bad weather or low tides, to signify that the pilots cannot get off, and that the harbour cannot be approached with safety by strangers. A blue burgee on the ball-pole signifies high water at the pier head.

Directions for entering Rye Harbour.—The lights in line N. by W. lead over the sands in front of the harbour; and having left the black buoys on the port hand and the white buoy on the starboard, steer to pass to the south-west of the small buoy placed at the end of a low stone-work extending 400 feet from the Dolphin, then keep close to the eastern pier, and when as far up as the pilot's houses, either anchor or make fast alongside one of the seven berthing places on the eastern shore.

DUNGENESS.—To the eastward of Rye, and between it and Hythe, is Romney Marsh, an extensive tract of land, the south-east extreme of which is named Dungeness. The shingle beach at the Ness is low and

flat, the highest part being only 4 feet above the level of high-water springs; off the pitch of the Ness near the lighthouse it is steep-to, there being 4 fathoms at 100 yards, and 15 fathoms at 330 yards from the beach.*

LIGHTS.—On Dungeness, at about 450 yards within high-water mark, stands a lighthouse, 92 feet high, coloured red and white in alternate horizontal bands. From the lantern, at an elevation of 107 feet above high water, is exhibited a *fixed* white light of the first order visible seaward between the bearings of E. ¼ N. and S.W. by W. ½ W., and in clear weather should be seen from a distance of 15 miles. The light shows *red* over Dungeness West road, or between the bearings of E. ¼ N. and the land; and *red* over the East road or between the bearings of S.W. by W. ½ W. and the land.†

Additional Light.—By the Trinity house observations between the years 1792 and 1850, Dungeness point has advanced seaward 530 feet or about 9 feet per annum; from 1850 to 1871 the advance was 280 feet, or from 13 feet to 14 feet per annum. In order to define the south-east extremity of the beach, an additional lighthouse is placed as near the high-water line as practicable, S.S.E. ¼ E. 225 yards from the high light tower, and exhibits a *flashing white* light, showing a quick flash at intervals of *five seconds*, the flash being of two seconds duration; the light is elevated 28 feet above the level of high water, and is visible over the same arc as that covered by the high light.

Beacon.—In order to define the eastern extremity of Dungeness, a beacon consisting of a mast 50 feet high, with two large globes fixed vertically thereon, is placed on the point a few yards above high-water mark, E. by S. ½ S. from the high lighthouse.

Fog Horn.—During foggy weather a powerful horn is sounded from the additional lighthouse at Dungeness. The mouth of the horn traverses an arc of 210°, namely from N.E. by E. ½ E. (round South) to W. ½ N., and *vice versâ*, so as to point in every direction between those bearings; and gives two blasts in quick succession every *two minutes*, the first blast a high note, the second a low note.

PILOTS.—Three pilot cutters cruize between Dungeness and the South Foreland, to supply vessels coming from the westward with pilots; one will be found off Dungeness, the second in the fairway between

* *See* Admiralty chart :—England, south coast, sheet 7, Dungeness to the Thames, including Dover strait, No. 1,895 ; scale, $m = 0{\cdot}68$ inch.

† This lighthouse was erected in 1792, at 100 yards distance from the sea at low water, by Thomas William Coke, Esq., of Holkham House, in the county of Norfolk, the old lighthouse, which originally stood 546 yards to the northward, having become useless to navigation, by the extension of the point.

Dungeness and Dymchurch, and the third off Folkestone, well out in the fairway.

The cutters having pilots for London on board, will exhibit in addition to the white masthead light, two flare lights in quick succession, every fifteen minutes. These flare lights will distinguish such pilot cutters from foreign pilot boats in the vicinity.

Life Boats are stationed at Lydd and at the Coast-guard Station at Little Stone point near New Romney.

ANCHORAGE.—The roads on either side of Dungeness afford excellent and extensive anchorage, according to the state of the wind, with good holding ground, consisting of fine sand over clay and mud.

The West Road comprises the space between the first building westward of the lighthouse, and the black coast-guard buildings at Jewrys gap. It affords good shelter from winds between North and E. by S., and is much frequented by vessels bound to the northward. The best anchorage is in about 6 fathoms, with Romney church tower in one with Lydd church N.E. $\frac{3}{4}$ E., and Dungeness lighthouse E. $\frac{1}{4}$ S. Smaller vessels may run farther in towards the beach, guarding always against a sudden shift of wind. The western tide runs easy, and affords a good slack for running or working in.

The East Road affords good shelter from westerly winds to vessels of all classes in from 4 to 12 fathoms, with the wind between N. by E. and S.W. A good position is in 7 fathoms, with Lydd church just open north of No. 2 battery, bearing W.N.W., and the lighthouse S.W. by W. $\frac{1}{4}$ W.

At Night the rays of *red* light, already described, define the outer limits of the anchorage in West and East bays.

STEPHENSON SHOAL.—About 3 miles W. $\frac{3}{4}$ S. from Dungeness lighthouse, is the eastern end of a narrow ridge of sand, named Stephenson shoal, which extends one mile in the same direction, with depths of 19 to 23 feet and 4 to 5 fathoms water around it. Lydd church in line with No. 4 coast-guard houses, bearing N. by E. $\frac{3}{4}$ E. leads over the eastern end in 25 feet; Rye church in line with the new church spire near Rye harbour, N.N.W. $\frac{3}{4}$ W., leads close to the western end in 26 feet.

NEWCOME, SWALLOW, and **ROAR BANKS** lie in the east road of Dungeness.

The Newcome is an accumulation of sand contiguous to the beach about 1$\frac{1}{2}$ miles to the northward of Dungeness, and must be carefully avoided

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when standing in shore or running for the road. A chequered black and white conical buoy marked Newcome, is placed in 19 feet $1\frac{4}{10}$ miles N.E. $\frac{3}{4}$ E. from Dungeness high lighthouse, and East three-quarters of a mile from the first battery north of the lighthouse; there are 5 and 6 fathoms close outside the buoy.

Swallow Bank, lying directly in the anchorage of the road, has a shoal spot of 18 feet on it, from which Dungeness lighthouse bears S.W., $2\frac{3}{4}$ miles, and Romney church N.W. by N. Lydd church in line with the second battery northward of the lighthouse W.N.W., leads to the southward in 31 feet water; and the lighthouse W.S.W., or Beachborough summer house in line with Hythe church N.N.E. $\frac{3}{4}$ E., leads to the eastward.

The Roar is a narrow ridge of sand running nearly parallel with the coast at one mile from high-water mark. Its south-west end commences between No. 2 battery, and the large opening named Romney Hoy, and thence it extends 3 miles in a N.E. by N. direction, terminating in 12 feet water about S. by E. $1\frac{1}{4}$ miles from Dymchurch. It carries a depth of 10 to 12 feet, and there are 2 and 3 fathoms between it and the shore. A vessel should not approach it within 6 fathoms.

HYTHE FLAT is the shallow ground extending from the shore between Dymchurch and Sandgate. The depth of 5 fathoms is one mile off Hythe, and 2 miles off Dymchurch. A vessel of large draught standing towards Hythe should tack when the South Foreland high lighthouse or light is shut in by Shakespear cliff; this mark however is of no use when off Dymchurch, as it leads into shallow water, towards the north end of the Roar bank.

As a rule, the soundings between the Roar bank and Sandgate decrease gradually, and vessels may approach the shore by the lead; at night the change of Dungeness light from white to *red* is the best guide.

At 2 miles to the westward of Hythe is a circular redoubt, named Brockman's barn, at which commences the well-known Dymchurch wall, a sea embankment for the rich pasturage of Romney marsh.

Life Boat.—A life boat is stationed at Hythe.

SANDGATE ROAD, off Sandgate 6 miles to the eastward of Dymchurch, is much frequented by light vessels bound to the northward, as the western stream is easy; it affords good shelter with the wind to the northward of E. by N. They anchor abreast the castle, with the pier clock at Folkestone just clear of Mill point, in 6 to 8 fathoms, over mud and clay, good holding ground.

FOLKESTONE HARBOUR.—Mill point is three-quarters of a mile eastward of Sandgate, and between it and Copt point, the first cliff

eastward of Folkestone, is the tidal harbour of Folkestone. All this part of the coast is bordered by a series of rocky ledges, extending from 1½ to 3 cables from the shore. Those off Mill point and abreast Folkestone church cover at 2 feet flood, when they are dangerous to coasters, as it is not easy to estimate the correct distance from the shore; Hythe church open of the stone wall fronting Shorncliff battery, leads to the south-west.

Copt ledge extends off Copt point, and is composed of large sandstone rocks, which uncover 6 feet at low-water springs. The Mole-head rocks are a continuation to the westward of Copt ledge, and uncover 2 feet. South Foreland high lighthouse open of Shakespear cliff, clears all these rocks.*

The harbour is the property of the South-eastern Railway Company, and has been cleared out for the use of their steamers, which ply to Boulogne; but the entrance dries at low-water springs. The harbour encloses an area of 14 acres, and is divided into two parts, named outer and inner harbour, by the railway which crosses it, over a swinging bridge. It has quay room to berth about twelve small vessels, besides the company's ten steamers, and there are good beaching places for boats, but it is in no way used for refuge. On its south side are the railway station, custom house, and baggage warehouse. A lighthouse 31 feet high, and a flagstaff for hoisting the tidal signals, stands on the south pier head of the outer harbour.

A new pier has been run out 150 yards in a south-east direction from the extremity of the horn which was projected S.S.W. from the south pier head to prevent the accumulation of a shingle bar, and to shelter the entrance from westerly gales; there are 15 feet at the pier end at low-water springs. This new pier is undergoing repairs and is to be extended 150 feet; part of the work is now completed; the breadth is also to be increased to 60 feet.

There is a patent slip in the harbour, but it is only used for the company's vessels, the largest of which is 560 tons, and 8 feet draught: the slip is 450 feet long, 19 feet gauge, and its incline one in 24. There is also an excellent gridiron, 220 feet long, on the north side of the coal wharf, for the use of the Railway Company's largest steamer, or other vessels not exceeding 9 feet draught. Thirty-two vessels belong to the port, exclusive of 35 large fishing luggers, and their total registered tonnage is 3,554 tons. The population of the town in 1881 was 18,300.

Tides and Tidal Signals.—It is high water, full and change, at Folkestone, at 11h. 7m.; springs rise 20 feet, neaps 16½ feet. The average depth is 20½ feet between the pier heads at high-water ordinary

* *See* Admiralty plan, Folkestone harbour, No. 1,991; scale, *m* = 15 inches.

springs, and 14 feet at neaps. During the equinoctial months, and preceding heavy gales, there are sometimes 23 feet between pier heads at springs, and 16 feet at neaps; and during the continuance of settled fine weather not more than 10 feet at neaps. There are 15 to 18 feet in the outer harbour at high-water springs, and 13 feet at neaps. The difference of level between the entrance of the outer harbour and the west end of the inner harbour is 5 feet, and vessels of 13 or 14 feet draught may safely enter the latter at high-water springs.

Day Signals.—A red flag will be hoisted half-mast at the harbour flagstaff on the south pier head of the outer harbour, when the depth of water at the entrance of the harbour is 12 feet.

The red flag will be hoisted at the mast-head, while the depth of water is 14 feet.

When the depth of water is above 14 feet, a black ball will be shown under the red flag.

When the flag is hauled down to the base of flagstaff, it indicates that caution is necessary.

When the red flag is not shown, there is less than 12 feet water, or some obstruction in the fairway; or the harbour is inaccessible.

Night Signals.—A fixed *red* light elevated 37 feet above high water, will be exhibited from the harbour south pier lighthouse, while there is 12 feet water between the pier heads. A *white* light will be shown under the red light from the same lighthouse, while the depth of water is 14 feet between the pier heads. When the red light is blinked at intervals, it indicates that caution is necessary. When the lights are not exhibited, there is less than 12 feet water, or some obstruction in the fairway; or the harbour is inaccessible.

Mariners are cautioned against entering the harbour when the red flag is not shown or when the red light is not exhibited. Vessels entering under such circumstances are liable to a penalty.

LIGHTS.—An iron skeleton lighthouse stands on the extremity of the new pier, South 244 yards from the lighthouse on south pier head of the harbour. It exhibits at 31 feet above high-water a *fixed* light all night, visible in clear weather at a distance of 6 miles. The light shows *green* seaward between the bearings of E.N.E. and W. by N., which lines of bearing pass about 100 yards outside the Oak End rocks on the west side of the pier, and the same distance outside the Mole Head rocks on the east side; and it shows *white* to the northward of these limits or towards the land. The light changing from *green* to *white* indicates that the vessel is in the line of danger; but the change can scarcely be distinguished. A bell is sounded during fog.

Two perpendicular white lights, 6 feet apart, are placed at the extremity of the pier extension. These lights are placed for the guidance of vessels, and are moved seaward as the pier is extended.

Directions.—All vessels are strictly cautioned against entering Folkestone harbour when the red flag is not shown by day, or the *red* light at night. When entering it must be remembered that with the flood there is generally a strong set towards the south pier head, and an eddy along the shore from Copt point towards the entrance. The Congregational church spire, in line with the lighthouse on south pier head, will lead westward of the Mole Head rocks.

The anchorage off Folkstone is only used by vessels waiting tide to go into harbour, for it is much exposed and limited, there not being room for more than four or five to ride at the same time. The best holding ground is in 7 to 10 fathoms clay and sand, with the new pier lighthouse in line with the eastern houses near the north side of the harbour, bearing N. by E., and the church in one with a terrace on the beach west of the clock-house. At night keep the *red* light a little open west of the *green* light on the new pier.

Eastware bay is between Copt point and the railway tunnel through Abbots cliff; and though it has good holding ground, and well sheltered on the west side by Copt point and ledge, yet it can only be recommended as a temporary anchorage for vessels waiting tide. The best berth is in about 5 fathoms, in the middle of the bay, with Folkestone church a little open of Copt point. The shore of the bay is flat and covered with large stones, which makes landing bad at low water. Between this bay and Shakespear cliff there is no good anchorage off the coast, as the water is deep and the ground foul.

Shakespear cliff is the first chalk cliff westward of Dover, and when seen from the eastward presents a conical appearance; but from the southward there is nothing remarkable in its features; on its summit is a flagstaff, on which is hoisted storm signals to passing vessels.

DOVER BAY and PORT.—The town of Dover, in the western part of the bay, and about 5½ miles eastward of Folkestone, is easily recognised by its historic castle, which stands on an eminence on the east side of the town, and is surrounded by works ancient and modern occupying an area of about 30 acres.

Mole head Rocks which dry at low-water springs, extend one cable E.S.E. from the east pier end of the outer or tidal harbour.

The port or tidal harbour is 12 acres in area, and communicates with the basin named Granville dock of 6 acres, and the Wellington dock or Pent of 11½ acres, in which is a patent slip. The entrance to the tidal harbour is between two piers, but it is narrow and open to the south-

east. Formerly with gales from the westward, the sea broke across it to the distance of 300 feet off, and the pier heads being only 140 feet apart vessels required careful steerage in entering; the Admiralty pier, originally commenced for a great harbour of refuge, has much improved the entrance, though it is still bad with on-shore gales.*

The best time to enter the tidal harbour is when there is sufficient water on the flood, or soon after high water. There are 21 feet at the entrance at high-water springs, and 17 feet at neaps. The harbour has 18 feet in it at high-water springs, and 14 feet at neaps, and dries an hour below low water; but the depths are quite uncertain, as much depends upon the winds, which at times makes a great difference in the flow.

Granville dock has a mean depth of 23 feet at high-water ordinary springs, and 19 feet at ordinary neaps. Vessels drawing 19 to 20 feet water can enter at high-water springs, and those drawing 15 to 16 feet can enter at neap tides. The quays afford every convenience for loading and unloading cargo.

Wellington dock or Pent has a depth of 15 feet at high-water springs and 11 feet at neaps. The gateway to the Pent is 56 feet wide, and the sill is one foot above the level of the outer or tidal harbour. The patent slip, 450 feet long, with 115 feet length of cradle, is worked by steam, and is capable of taking a vessel of 500 tons burthen.

The Admiralty Pier extends in a S.E. by S. direction from Cheeseman head, beginning 200 yards westward of the entrance to the harbour, it is 730 yards long. The outer part is available for vessels of large draught on either side at any time of tide; and there is a fresh-water pipe at each staging. The tidal trains go regularly on to the pier to meet the continental mail steamers.

At half flood the eddy makes to the westward out of Dover bay, and meeting the offing stream running to the eastward at the end of the pier, causes a heavy sea in westerly gales; but thence to the entrance of the harbour the water in the space sheltered by the pier is smooth.

LIGHT.—On the outer end of the Admiralty pier is erected a tower, 30 feet high and painted red, from which is exhibited a *fixed white* light, varied by flashes at intervals of 7½ seconds. The light is elevated 44 feet above high water, and in clear weather the fixed light should be visible from a distance 6 to 7 miles—the flashes somewhat farther.

During foggy weather a bell will be sounded from the lighthouse and give single strokes at intervals of 7½ seconds.

Mooring Buoys.—On the eastern side of the pier are two mooring buoys; the outer one of which lies N. ½ E., 500 feet from the pier light;

* *See* Admiralty plan, Dover bay, No, 1,698; scale, m = 14·7 inches.

the inner buoy lies at the same distance west of the outer one. On the western side of the pier, a mooring buoy is situated 2 cables west of the pier light. These three sets of moorings are for the use of large ships. Two other mooring buoys—one on either side of the pier—lie inshore of the preceding.

Anchorage.—During the prevalence of north-easterly winds, Dover bay is much frequented by coasters bound to the northward, the usual anchorage being abreast the Esplanade, with the South Foreland light-houses shut in by the land; but small steam-vessels anchor closer inshore. With easterly winds the mail packets haul alongside the western side of the pier when not in the tidal harbour. The extension of the Admiralty pier affords shelter from winds to the westward of W.S.W., but though with these winds a heavy swell is experienced, it is not dangerous, as the strong eddy which is created by this breakwater sets to the westward, and thus becomes a weather tide.

Vessels using the anchorage in Dover bay during westerly winds should avoid anchoring with the end of the Admiralty pier on a S.W. by W. bearing; for on this line, between the tidal periods of 5 hours flood and half ebb, the eastern stream carrying the westerly swell with it up channel and running close past the end of the pier with great velocity, is there met by the eddy or out-flow from Dover bay, which opposing the progress of the advancing swell, throws up a short turbulent sea along the line of contact in a N.E. by E. direction from the pier end, causing vessels to roll and surge about, risking fouling their anchors and snapping their chains.

Large vessels should therefore anchor outside this line in not less than 6 fathoms at low water; with the keep of Dover castle within or westward of the Castle jetty, one third the distance towards the Boundary groyne, bearing N. ¼ W., and the end of the Admiralty pier West or W. by S.; Shakespear cliff will then be nearly in line with the inner landing stage of the Admiralty pier.

Small vessels should anchor with the entrance of Dover harbour open, and not farther out than to have the end of the Admiralty pier bearing S.W. by S.

The anchorage, however, on either side of the Admiralty pier should only be considered temporary, especially for large vessels or those without steam power, for the shelter is not great, and the holding ground not good; therefore immediately the pier becomes a lee shore, vessels should quit the anchorage.

Shipping.—In 1870, 2,132 vessels entered the port inwards, and 1,769 cleared outward. There were belonging to the port 54 vessels, representing 4,075 tons. In 1871 the population was 28,270.

Signals.—On the Marine parade there is a private flagstaff for the purpose of acknowledging vessels' numbers as they pass the port, either outward or homeward bound, and they are immediately reported by telegram to Lloyds. Signals can be received asking for assistance in case of distress.

Tides and Tidal Signals.—It is high water, full and change, at Dover, at 11h. 12m.; equinoctial tides rise 20½ feet, ordinary springs 18¾ feet, neaps 15 feet.

In the day a red flag with a black ball under it is hoisted at the south pier end, while there is from 7 to 10 feet water at the entrance; the red flag alone when from 10 to 13 feet; and the ball over the flag when 13 feet and upwards.

No signals are made between 7 feet at ebb and 7 feet at flood; and whenever, at other times, the harbour is inaccessible to vessels, the flag is hauled down, or the light or lights on the south pier extinguished.

Harbour Lights.—Two *red* tidal lights, of unequal heights, are exhibited from a staff on Dover south pier head, and a small low *red* light on the north pier head. This latter *red* light, and a similar *red* light on the low outer corner of the south pier, are shown when there are from 7 to 10 feet water at the entrance; the two *red* lights on the staff on the south pier, and the low *red* light on the north pier when above 10 feet, and till the water has fallen again to that level; and the single low *red* light on each pier when there are from 10 to 7 feet. These lights only point out the position of the piers, and do not indicate the channel.

A *green* light is shown all night from a lamp post near the Granville dock entrance; and when seen between the piers, leads into the fairway to and up the harbour.

A Life Boat is stationed at Dover.

SOUTH FORELAND LIGHTHOUSES.—The South Foreland, bearing E.N.E. 20½ miles from Dungeness, and N. ¾ W. 17¾ miles from cape Grisnez, is a bold headland faced with irregular chalk cliffs having layers of flint, in horizontal lines. On its summit are two white lighthouses, 449 yards apart, from which are exhibited two *fixed* white *electric* lights of the first order, elevated respectively 372 and 275 feet above high water, and visible in clear weather from distances of 26 and 23 miles; when in line bearing W. ¾ N., they lead one mile south of the Goodwin sands. The high light is visible seaward between the bearings of S.W. by S. and E. by N. ¼ N.; the low light between S.W. ¾ W. and E. by N. ½ N. The western lighthouse is 69 feet high and square; the eastern lighthouse, 49 feet high and octagonal, stands near the edge of the cliff.

Caution.—A submarine cable extends from the South Foreland to Belgium. It takes an East direction from the Foreland, until without the stream of the Goodwin sand, passing about half a mile to the northward of the South Sand Head light-vessel, after which it runs E.S.E. across to the Flemish banks. Vessels are cautioned not to anchor with this mark or bearing on, lest they damage the electric cable, or lose their anchors.

A submarine cable also extends between the South Foreland and France, and in order to prevent mischief occurring to it, vessels should not anchor within the distance of 3 or 4 miles of the English shore with the South Foreland high lighthouse bearing between North and N.W., nor beyond that distance when it bears N.W. $\frac{3}{4}$ N., on which bearing it will appear in one with a dark patch on the cliff. Neither should vessels anchor on the French coast, with the two conspicuous windmills of Coquelles, which stand on the high ground between Calais and Sangatte bearing between S. by E. and S.E. by S.

DOVER STRAIT.—The channel navigation for large ships is much straitened in the vicinity of Dungeness, by banks composed of coarse sand and broken shells, the principal and most dangerous of which are, the Varne, the Ridge or Le Colbart, the Bassurelle, and the Vergoyer. There are only 9 feet at low water on the Varne; no more than 6 feet on the Ridge; $3\frac{3}{4}$ fathoms on the Bassurelle; and 12 feet on the Vergoyer. The Varne and Ridge lie exactly in the fairway of Dover strait, at nearly equal distances from the English and French coasts, and nearly parallel with each other; none of these banks are continuous, but consist of shoal patches, having deep water between them.

VARNE SHOAL, the northernmost of these dangers, lying in a N.E. by E. and S.W. by W. direction, is about $4\frac{1}{2}$ miles in length between the depths of 7 fathoms at each end, and its breadth varies from half to three-quarters of a mile. It is steep-to, and from the shoalest spot of 9 feet, which lies about one mile from its north-east end, Dover castle bears N. $\frac{3}{4}$ E. $8\frac{1}{2}$ miles. From the north-east end of the shoal the South Foreland bears N. by E. $\frac{3}{4}$ E. $8\frac{1}{4}$ miles, Dover Castle N. $\frac{1}{2}$ E. $7\frac{3}{4}$ miles, and from the south-west end Dover castle bears N. by E. $\frac{3}{4}$ E. $11\frac{1}{4}$ miles, and Dungeness lighthouse W. $\frac{3}{4}$ N. $12\frac{1}{2}$ miles.

There are strong ripplings over the Varne both at springs and neaps, and during tempestuous weather a heavy sea, which would endanger any vessel attempting to cross it. The eastern terrace at Sandgate between the above chalk-pits N. $\frac{3}{4}$ W., or the square tower of Lympne church on with Lympne windmill, clears the south-west end.

VARNE LIGHT-VESSEL lies in 15 fathoms, about one mile West from the depth of 7 fathoms on the south-west end of the shoal, and

exhibits at 35 feet above the sea a *revolving red* light, which attains its greatest brilliancy *every twenty seconds*, and in clear weather should be visible from a distance of 10 miles. The vessel carries a ball at mast-head by day, and from her Dungeness lighthouse bears W. by N. 12 miles; South Foreland high lighthouse N.E. by N. 12½ miles; N.E. Varne buoy N.E. by E. 6 miles; and cape Grisnez lighthouse S.E. ½ E. 12$\frac{3}{10}$ miles. During foggy weather a gong is sounded. A gun is fired if a vessel be seen standing into danger.*

Buoys.—A large red spiral buoy, surmounted by staff and globe, and marked N.E. Varne, is moored off the north-east end of this shoal in 13 fathoms at low water; with Dungeness lighthouse bearing W. ¼ S. 16½ miles; South Foreland high lighthouse N. by E. ½ E. 7½ miles; cape Grisnez lighthouse S.S.E. ⅛ E. 11¾ miles; and the Varne light-vessel S.W. by W. 6 miles.

Watch Buoy.—A black can buoy, marked *Varne light watch*, is moored in 9½ fathoms at low water, S.E. by E. $\frac{7}{10}$ mile from the Varne light-vessel.

RIDGE SHOAL (Le Colbart).—The north-east end of this shoal in 7 fathoms lies about 2½ miles south of the body of the Varne, there being 16 to 20 fathoms in the channel between them; it then takes a S.W. direction for about 8¼ miles to the same depth, and is about three-quarters of a mile broad. Like the former shoal it is steep-to, and composed of sand and broken shells, the shoal patches lying in ridges across the stream, which occasion strong eddies even at neap tides. There is much sea on it during a weather tide, and in bad weather there are breakers on the shoalest parts; no vessel should therefore attempt to cross it under any circumstances.

The shoalest water, 6 feet, on the Ridge lies about 2¾ miles from its south-west end, with the Varne light-vessel bearing N. ¼ E. nearly 5 miles; cape Grisnez E. by S. ¼ S. 10½ miles, with the summit of mount Couple appearing a little south of it; and Dungeness lighthouse N.W. by W. ¼ W. 13½ miles. From the north-east extreme of the shoal, in 7 fathoms, cape Grisnez bears S.E. ¼ S. 8¾ miles; the high trees at the back of Hythe are in line with the Swiss terrace at Sandgate, N.N.W. ½ W.; and the Varne light-vessel W. by N. ¼ N. 4 miles. Mount Lambert—a conspicuous hill near Boulogne, with a fort on it—in one with the dome of the new cathedral at Boulogne, S.E. ½ E., or Sandgate Swiss terrace between the two chalk pits, North, or the revolving light on cape Grisnez bearing E. ¼ S., leads south of the south-western extreme in 9 fathoms.

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* For light-vessels' riding lights and signals, *see* page 26.

BASSURELLE SHOAL, the body of which bears about W. ½ N. 18 miles from cape Alprech, and S. ¼ W. the same distance from Dungeness, is about 4½ miles long E.N.E. and W.S.W. within the depth of 10 fathoms, and 2 miles broad; its shoalest parts forming a succession of elevated flats, the most considerable of which lie towards the north-east extremity of the bank, and serve as a basis for eight small hillocks of sand, upon the highest of which—when surveyed in 1835—a depth of only 22 feet was found at low-water springs.

This bank is steep-to and dangerous to vessels of large draught at low tide; at the springs there is a strong rippling over it, and in bad weather, during a weather tide, the sea breaks violently upon its highest parts.

The VERGOYER is a sand-bank about 14 miles in length N.E. by E. ½ E. and S.W. by W. ½ W., and one mile in breadth, lying within 10 and 14 miles of the French shore. The general depth on its southern part is 5 to 7 fathoms, the eastern edge being steep-to, and the western edge of a gradual slope; but near its north extreme is a high flat spot about one mile in diameter, with only 12 feet on it at low-water springs. From this spot, which lies about 10 miles off shore, the land in clear weather may be distinctly seen from the hills (at the foot of which stands the town of Etaples) to cape Grisnez lighthouse, which bears from it about N.E. ¾ E. easterly 19½ miles, and the lighthouse on cape Alprech, E. ¾ N. 11½ miles.*

Mount Lambert midway between Outreau church and Alprech guard-house, E. ¼ S., leads to the northward. The ripplings on this shoal during springs occasion a high sea on a weather tide; and with a strong breeze, from whatever quarter it may blow, the sea breaks with violence upon the northern end, especially from half flood to half ebb.

A conical buoy painted red and black in horizontal stripes is moored in 13 feet water on the north head of Vergoyer bank.

BULLOCK BANK, lying S. ¼ W. 11 miles from Dungeness, is also indicated by strong ripplings. It has 9 to 10 fathoms water on it, 17 fathoms at half a mile to the northward and southward, and a general depth of 11 to 14 fathoms between it and the south-west end of the Ridge, and Les Ridens. Romney church a little open east of Dungeness light-house, N. ½ E., leads over the bank in 9 fathoms.

LES RIDENS form a bank composed of a number of patches of sandstone and gravel, lying S.S.E. ¾ E., nearly 16 miles from Dungeness, about 3½ miles S. by W. from the south-west end of the Ridge, and

* Cape Alprech lighthouse cannot be seen at this distance except when the weather is very clear; in fine weather the light is visible 12 miles off.

W. by N. ½ N. 12 miles from the Napoleon column at Boulogne. The bank carries a depth of 6 to 10 fathoms, and is indicated by strong ripplings over it when the tide runs with any strength, and by a heavy sea in bad weather. Cape Blancnez well open of cape Grisnez leads north of the bank, and cape Grisnez bearing N.E. by E. ½ E., leads south.

DIRECTIONS.—The course and distance from Dungeness to the South Foreland is N.E. by E. ¾ E. 20½ miles, and the soundings vary from 17 to 13 fathoms. After rounding the Foreland at the distance of half a mile or one mile, the course is about N.E. by N. for the anchorage in the Downs (*see* page 24).

A vessel turning to windward in thick weather, either up or down the English Channel, should not, when standing in-shore between Beachy head and Dungeness, go into less than 15 fathoms at low water. Between Dungeness and the South Foreland, 12 fathoms is a safe depth, as it will keep her outside the banks off Dungeness, and the rocks off Folkestone. Standing off shore, the ridge should not be approached nearer than 17 fathoms water, nor the Varne than 16 fathoms.

The Varne light is a good guide for avoiding these shoals. When Dungeness light bears N.W. ¼ N. a vessel will be on the line of the south-west extreme of the Ridge, and may stand towards that shoal till the Varne light bears N.N.E. ½ E. Having arrived to the northward of the light-vessel, she may in standing toward the Varne bring the Varne light as far as S.W.; when Dover pier light bears N. ¾ W. she will be to the northward of the north-east end of the shoal. In standing in-shore between Hythe and Eastware bay, go about directly the South Foreland lights are shut in by Shakespear cliff; off Folkestone, the helm should be put down when the high light disappears.

The DOWNS, in a general sense, implies the numerous banks lying immediately off the coast between the South and North Forelands; and though anchorage may be found anywhere in the channels which separate them, that which is commonly used, and known by the above name, is off the town of Deal, between Walmer castle and the north part of the town, and outside the chequered black and white buoy on Deal bank.*

From the South Foreland the chalk cliffs continue nearly as far as Walmer castle, but thence the shore is low, and bordered by a beach of shingle mixed with sand, to within 1¾ miles of Ramsgate; it then becomes elevated, and about the North Foreland is faced by steep chalk cliffs of moderate height.

* *See* Admiralty charts:—The Downs, with views, No. 1,828, scale, $m = 2$ inches; and North Sea, sheet 1, No. 1,406, scale, $m = 0{\cdot}3$ of an inch.

NORTH FORELAND LIGHTHOUSE.—The North Foreland is a promontory of nearly perpendicular chalk cliffs, which, varying from 60 to 120 feet in height, form the sea front of the north-east side of the Isle of Thanet. It is the more conspicuous from an octagonal white light tower, 85 feet high, which stands on a rising ground about 300 yards within the edge of the cliff, and exhibits at 188 feet above high water an occulting white light, which once in *every half minute* suddenly disappears for *five seconds*, and then as suddenly reappears at full power; the light is visible in clear weather from a distance of 19 miles. In order to enable vessels at night to keep eastward of Margate sand, the light shows *red* between the bearings of S. by E. ¾ E. to S. by W. or from the Tongue light-vessel to one cable east of Margate sand.

At half a mile northward of the lighthouse is Moro castle, a building of flint standing close to the cliff edge on the south point of Kingsgate bay; at one quarter of a mile farther northward is Neptune tower, with a wide basement surrounding it.

GOODWIN SANDS.—These well-known sand-banks have been divested of much of their danger since the present excellent system of lighting and buoyage has been completed, their limits being well marked by light-vessels and buoys. Along their eastern and northern edges large patches dry at low water, and remained uncovered for some time, offering fine tracts of level and firm ground. When covered, the sands are in motion, and are carried by the prevailing tides, which at times considerably alter the form of the shoal, though its general outline does not greatly change.

The sands are divided into two divisions, each tapering to the southward. The northern division, named the North Goodwin, is of an irregular semi-circular shape, the northern or outer edge forming the curve, and the southern the base. That portion of the southern division which lies to the eastward is named the South Goodwin, and South Calliper, and that to the westward the Bunt and Fork. The northern part of each division is dry in many places from 7 to 4 feet above low water. Between the South Goodwin and the Fork is the deep inlet named Trinity bay, from which there is an outlet to the north-east, through the Swash-way, which undergoes many changes, but is much frequented by the boatmen of the coast.

SOUTH SAND HEAD LIGHT-VESSEL, moored in 14 fathoms about one mile and four-tenths to the south-westward of the 5-fathom line at south extreme of the South Goodwin, exhibits at 34 feet above the sea a *fixed* white light, visible in clear weather from a distance of 10 miles. The light-vessel has one mast, is painted red, with the words

[illegible] a ball at mast head. During foggy weather a [illegible] will sound three blasts in quick succession every two minutes; the first blast a low note, the second a high note, and the third a low note. A gun is fired if a vessel be seen standing into danger.*

From the light-vessel, the South Foreland lighthouses are in line bearing W. ¾ S.; the Gull light-vessel N. by E. ½ E. [illegible] miles, with the [illegible] [illegible] [illegible] in line, [illegible] miles; and the East Goodwin light-vessel [illegible] [illegible] miles. Kingsdown mill [illegible] Kingsdown church N.W. ½ W., [illegible] [illegible] to the southward; and Upper Deal mill in line with Walmer church, N.W. ½ N., leads 2 cables to the southward of the 5-fathom line at north extreme of the South Goodwin.

GULL STREAM LIGHT-VESSEL, moored in [illegible] fathoms in the Gull stream, about seven-tenths of a mile westward of the 5-fathom western edge of the North Goodwin, exhibits at 38 feet above the sea a *revolving white light*, which attains its greatest brilliancy *every twenty seconds*, and is visible 7 miles. The vessel has one mast, carries a ball at mast-head, is painted red, with the word *Gull* on her sides. During foggy weather a gong is sounded, and a gun is fired if a vessel be seen standing into danger.*

From the light-vessel, the South Foreland high light is on with the south side of Old Stairs bay, S.W.; Ash church one-third from St. Peter's towards St. Clement's church at Sandwich, N.W. by W. ¾ W.; Middle Brake buoy N. by W. ½ W., 1$\frac{3}{10}$ miles; North Bar buoy, N.N.E. ¾ E., 3$\frac{1}{10}$ miles; Gull buoy, N.E. ½ N., 3$\frac{1}{10}$ miles; N.W. Goodwin buoy (the Goodwin Knoll buoy in line), N.E. by E. ¾ E. 1$\frac{4}{10}$ miles; N.W. Bunt buoy, S. by W., 1½ miles; Bunt head buoy, S.S.W. 2¼ miles; and South Brake buoy, S.W. by W., 1$\frac{3}{10}$ miles.

GOODWIN or NORTH SAND HEAD LIGHT-VESSEL, moored in 10 fathoms, about one mile eastward of the 5-fathom north extreme of Goodwin knoll, is chiefly intended for the use of vessels coming from the northward to guide them eastward of the Goodwin sands. The vessel exhibits at an elevation of 36 feet above the sea, a *flashing white* light, which shows *three flashes* in quick succession, followed by an eclipse of *thirty-six seconds*, the whole revolution occupying *one minute*. In clear weather the light should be visible from a distance of 10 miles. The vessel has three masts, is painted red, has the word *Goodwin* on her sides, and carries a ball at each masthead. During foggy weather a gong is sounded, and a gun fired if a vessel be seen standing into danger.*

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* For light-vessels' riding lights and signals, see page 26.

From the light-vessel the South Foreland high lighthouse bears S.W. by W.; Ramsgate pier lighthouse, W. by N. $\frac{3}{4}$ N; North Foreland lighthouse, N.W. $\frac{1}{4}$ N., $6\frac{1}{10}$ miles; East Goodwin light-vessel S. by W., $6\frac{1}{2}$ miles; Kentish knock light-vessel (*revolving* light) N.N.E. $\frac{1}{4}$ E., 21 miles; and Galloper light-vessel (two *fixed* horizontal lights), N.E. 29 miles.

St. Peter's church in line with Broadstairs cliff N.W. $\frac{1}{2}$ W., leads about 2 cables south of the light-vessel, and three-quarters of a mile to the northward of the Goodwin knoll buoy. Ramsgate and St. Lawrence churches in line N.W. by W. $\frac{3}{4}$ W., leads about 3 cables south of the light-vessel, and just clears the northern edge of the Goodwin knoll in about 30 feet water.

EAST GOODWIN LIGHT-VESSEL, moored in 30 fathoms, about $1\frac{1}{2}$ miles to the eastward of the Goodwin sands, exhibits at an elevation of 37 feet above the sea, a *green revolving* light, at intervals of *fifteen seconds*, visible in clear weather from a distance of 10 miles. The vessel has one mast, with the words *East Goodwin* painted in large letters on her sides, and carries at the masthead a beacon, in the shape of a diamond surmounted by a half-diamond. During foggy weather a gong is sounded.*

From the light-vessel the Goodwin beacon bears N.N.W. $\frac{1}{4}$ W. $2\frac{2}{10}$ miles, the North Sand head light-vessel N. by E. $6\frac{1}{2}$ miles, and the South Sand head light-vessel W. by S. $\frac{3}{4}$ S., $6\frac{1}{2}$ miles.

GOODWIN BUOYS.—The south-western and eastern sides of the Goodwin sands are marked by the following five large buoys, and vessels are cautioned, when passing to the eastward of the sands, to keep half a mile eastward of the four large conical buoys, as the tide sets with great strength to the north-west towards and over the sands.

S.W. Goodwin Buoy, black can, lies in 13 fathoms, with the East end of Admiralty pier at Dover, just open of south Foreland, W. by S. $\frac{1}{2}$ S.; South Sand head light-vessel S.S.W. $\frac{3}{4}$ W., 2 miles; and Bunt head buoy N. by E., $2\frac{7}{10}$ miles.

South Goodwin Buoy.—A high black and white chequered conical buoy, with staff and cage, lies in 14 fathoms, with Ringwold church just open to the southward of the flagstaff of Mr. Curling's house at Kingsdown, W.N.W.; East Goodwin light-vessel E. by N. $\frac{1}{2}$ N., $3\frac{7}{10}$ miles, South Sand head light-vessel W. by S. $\frac{3}{4}$ S., $2\frac{9}{10}$ miles, and S.E. Goodwin buoy N.E. by E. $\frac{1}{4}$ E. $2\frac{9}{10}$ miles.

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* For light-vessels' riding lights and signals, *see* page 26.

Gull Sand Buoy.—Gull sand is a narrow ridge about one mile long, N.N.E. and S.S.W., with 3 fathoms on its shoalest part, which is near the middle. A chequered black and white conical buoy lies in 6 fathoms, three-quarters of a mile to the south-east of the shoalest part, with St. Lawrence church in line with the centre of Augusta stairs at Ramsgate N.W. by W. ½ W.; South Foreland high lighthouse in line with the end of the north cliff of Old Stairs bay S.W., the lighthouse will also be nearly in line with the Gull Stream light-vessel; Elbow buoy bears N. by E., 2½ miles; North Sand head light-vessel E. by S. ½ S. 2¾ miles; and North Brake buoy W. by N. ¼ N. $1\frac{6}{10}$ miles. Vessels of large draught should pass eastward of the buoy, as there are only 4 fathoms one quarter of a mile inside or westward of it.

Elbow Buoy.—The Elbow is a small shoal having 18 feet water on it, and is marked by a buoy, striped black and white vertically, with staff and cage, which lies in 4 fathoms close to the south-east edge of the danger, with the North Foreland lighthouse N.W. by W. ¼ W., $2\frac{4}{10}$ miles; St. Lawrence church tower open north of Dumpton point, W. ½ S.; Gull buoy S. by W. 2½ miles, and the east buoy of Margate sand N. by W. ¼ W., 5½ miles.

As there are various shoal patches of 16 and 18 feet water between this shoal and the shore, the passage should never be attempted but by those well acquainted with its navigation.

Broadstairs Knoll Buoy.—In addition to the shoal patches between the Elbow and the shore, there are other numerous patches in the Inner channel to Ramsgate, to the westward of the Elbow and Gull sands, which render it unfit for any vessels but those of light draught. Of these, the extensive knolls, lying off Broadstairs, have from 9 to 20 feet on them, and their outer edge is marked by a buoy chequered black and white which lies in 3¼ fathoms, with St. George's church, Ramsgate, the apparent width of its tower open south of Hearson mill W. ¾ S.; St. Peter's church tower in line with the north side of the house on end of Broadstairs north cliff N.W. by W.; Elbow buoy E. by N. ½ N., $1\frac{3}{10}$ miles; Gull buoy S. by E. ¾ E., $2\frac{2}{10}$ miles; and North Brake buoy, S.S.W. ¼ W., $1\frac{9}{10}$ miles.

ANCHORAGE IN THE DOWNS.—A good berth for large ships is in about 8 fathoms, over chalky bottom, with the South Foreland high lighthouse—the low lighthouse is not seen—in line with the middle of Old Stairs bay, S.W.; and about a mile E.S.E. from the end of Deal pier. It is recommended that men-of-war, and merchant ships of large draught should not anchor north of this berth; and that vessels of about 16 feet draught should select that portion of the Downs (Small Downs)

to the northward of these marks and westward of the South Brake buoy. When anchored, take a bearing of the South Brake buoy, to enable the vessel to run for the Gull stream in case of parting or being obliged to slip. If moored, the hawse should be open to the southward.

The anchorage in the Small Downs is much more secure than that in the Downs, and is recommended for vessels of less than 16 feet draught, as it is more sheltered, with better holding ground, and shoaler water; besides which vessels are not so liable to be fouled by drifting ships, and in cases of necessity they have greater facilty for running to Ramsgate harbour.

Time Ball.—A black ball, at an elevation of 76 feet above the level of high water, is dropped daily from the mast on the Telegraph tower at Deal, for the purpose of giving Greenwich mean time to passing vessels. The ball is hoisted half-mast high at five minutes, and close up at three minutes before 1 p.m.: and is dropped at the instant of 1 p.m. Greenwich mean time: the time to be noted being the instant the ball begins to fall from the cross arms of the vane. Should any derangement of the machinery prevent the ball from being dropped at 1 p.m., it will be kept at the masthead for ten minutes, and will then be lowered gradually; it will again be raised and dropped by hand, at 2 p.m. Greenwich time, but the accuracy of this time cannot be guaranteed within two seconds.

Deal Pier and Light.—A pile pier runs out 1,100 feet from the esplanade at Deal, and ships in the Downs can be supplied with fresh water from the pier into their own casks at any time of tide, as there is a depth of 10 feet at the pier end at low water. A *fixed red* light is exhibited from the outer end of the pier.

Life Boats are stationed at Kingsdown, at Walmer, and at North Deal.

Signals.—A signal station is established at Deal; vessels making their numbers by the commercial code of signals are reported at Lloyds and advices forwarded.

DIRECTIONS.—A vessel bound into the North Sea from abreast the South Foreland should either pass the South Sand Head light-vessel close to on either side, and east of the Goodwin Sands; or run through the Gull stream. If intending to take the latter route, round the Foreland at the distance of a mile, in 12 to 14 fathoms water, and when the South Foreland lighthouses are in line W. $\frac{3}{4}$ N., and Deal town opens of the cliffs, steer N.E. by N. till Deal pier, outer end, bears West.

The vessel will now be near the entrance of the Gull stream, and should steer to bring the South Foreland high lighthouse over the middle of Old Stairs bay bearing S.W., which mark, kept on astern will lead between the Bunt head and South Brake buoys, direct for the Gull light-vessel.

This mark leads over the tail of a small detached shoal of 24 feet which lies 6 cables S. by W. ¼ W. from South Brake buoy. Vessels of heavy draught, therefore, should, when approaching within a mile of South Brake buoy, keep South Foreland high light rather in line with the south side of Old Stairs bay, which latter mark will lead eastward of the patch; and when Upper Deal mill comes in line with centre of Deal hospital, steer for Gull light-vessel.

After passing the light-vessel close to on either side, the leading mark (South Foreland high light over the middle of Old Stairs bay) may be again used until up to the Gull buoy; or, keep the light-vessel on a S.W. bearing until the North Foreland lighthouse bears N.N.W. ¼ W., or the North Sand Head light-vessel E. by S. ½ S.; when, either steer to the north-eastward, or haul up N. by E. ½ E. until abreast the Elbow buoy; whence a N. by W. ¼ W. course may be steered for the east buoy of Margate sand taking care to allow for a beam-tide. These directions must be attended to at low-water springs, by vessels drawing upwards of 15 feet, and these should pass eastward of the Gull buoy at that time of tide; the Gull stream light-vessel S.W. ½ W., will lead well clear.

A vessel in the Downs parting her cables, or obliged to slip during a southerly gale and run through the Gull stream, should endeavour to bring the South Foreland high lighthouse over the middle of Old Stairs bay, S.W., or if the lighthouse be not seen, steer so to pass about 2 cables east of the South Brake buoy, and then shape a course for the Gull stream light-vessel; thence steer to the north-eastward with the light-vessel S.W. ½ W.; and when the North Foreland lighthouse bears N.N.W. ¼ W., or the north Sand head light-vessel E. by S. ½ S., the ship may haul out to the eastward and lie to.

If wishing to regain her anchorage by turning to windward at the back of the Goodwin, do not, in standing towards that sand, bring the North Sand Head light-vessel eastward of North, nor come into less than 28 fathoms, until abreast of the East Goodwin light-vessel, when the North Sand Head light-vessel may be brought as far eastward as N. by E. ½ E.; or when standing towards the south-east part of the Goodwin sands between the East Goodwin and South Sand head light-vessels, the East Goodwin light-vessel should not be brought to bear to the eastward of N.E. ½ E. When the South Foreland lighthouses, and South Sand head light-vessel are in line W. ¾ N., she will be south of the Goodwin, and may bring Upper Deal mill in one with Walmer castle N.W. ½ N., which will lead to the southward of the 5-fathom line at south extreme of South Goodwin.

A vessel should not attempt to turn through the Gull stream to the southward until half-ebb; nor to the northward until half flood. In work-

ing to the southward, standing towards the Goodwin knoll, and along the north-west side of the North Goodwin, until the Gull stream light-vessel comes in line with the outer end of Deal pier, S.W. by W. ¼ W.; and towards the Gull and other shoals forming north-west side of Gull stream to 5 or 6 fathoms at low water, or until the South Foreland high light-house is in line with the north cliff of Old Stairs bay.

Between North Bar shoal and Middle Brake buoy, stand towards Brake sand until the South Foreland high lighthouse appears about midway between Kingsdown and Walmer castle, and in line with Middle Brake buoy about S.W. ½ S.; but between Middle and South Brake buoys stand no nearer than the line of the North Foreland lighthouse twice its apparent breadth open eastward of Broadstairs north cliff. When standing towards Bunt head, in the vicinity of N.W. Bunt buoy, Gull Stream light-vessel may be brought to bear N.N.E.; but towards Bunt Head buoy large ships should not bring Gull Stream light-vessel to the northward of N.N.E. ½ E.

To the southward of the Bunt Head buoy, or when Deal pier light bears W. by N. ½ N., a vessel may stand towards the Goodwin sand until the South Sand Head light-vessel bears S.W. by S. Towards Deal, tack short of the chequered black and white buoy, to avoid Deal bank; and thence to the South Foreland the shore may be approached to any convenient depth.

RAMSGATE CHANNEL is to the westward of the Brake sand, between the Small Downs and Ramsgate, and the only dangers in it are the Cross ledge with 12 feet water on it, and a flat with 9 feet which extends from the shore abreast No. 2 battery. Vessels of more than 11 or 12 feet draught should not use this channel at low-water springs, as there are not more than 12 or 13 feet in it from the fairway buoy to Ramsgate, a distance of about 2 miles.

Ramsgate channel is marked by three fairway buoys as follows:—

South Fairway Buoy, striped red and white vertically, lies in 17 feet, and marks the eastern edge of the shoal flat off No. 2 battery. The buoy is distant half a mile from the inner edge of the Brake sand, and 2¾ miles N. by E. from Deal Bank buoy. Vessels using this channel from the southward should pass this buoy on its eastern side.

Middle Fairway Buoy, chequered red and white, lies in 15 feet, North $1\frac{4}{10}$ miles from the South Fairway buoy, and seven-tenths of a mile from the edge of the Brake sand. From the buoy the lighthouse on Ramsgate west pier bears N.N.E. ¾ E.

North Fairway Buoy, striped red and white vertically, lies in 6 feet, one quarter of a mile from Ramsgate west cliff, with Ramsgate west pier lighthouse E.N.E. four-tenths of a mile.

RAMSGATE HARBOUR consists of an outer harbour formed by substantial stone piers extending 437 yards into the sea and enclosing an area of 42 acres; and an inner harbour or basin divided from the outer harbour by a stone cross wall. The piers are built on caissons at the surface of the chalk rock, and on the western pier head is a handsome granite lighthouse. The entrance is about 208 feet wide between the pier heads, where the depth is 20 feet at high-water and 5 feet at low-water springs, and 16 feet at high-water neaps.

Close to the eastern pier end a vessel of 8 feet draught may lie afloat, and go in or out except at low ebbs, but the depths are much influenced by the force and direction of prevailing winds. In the outer harbour are gullies about 140 feet wide, close to and parallel with the piers, in which vessels are safely moored alongside each other in tiers. The eastern gulley is the deepest and widest, having 4 to 5 feet at low water over mud bottom; the western gulley has only 3 feet in it over mud.

Two banks, the East and West, rise in the harbour; the former dries 5 feet, and the latter 2 feet, above low-water springs, and between them is a channel which dries in spots, leading to the gates of the inner harbour. The East bank is just awash at the time the tide ball is hoisted, which indicates 10 feet in the harbour, and being composed of sand and mud is of great service to vessels to run upon when they come in with loss of anchors. At the head or northern end of the eastern gully is a patent slip 450 feet in length, 350 feet of which is available for the reception of two vessels at the same time, from 300 to 500 tons burthen, and drawing in ballast 10 to 12 feet water.

The inner harbour is used for vessels to load or unload, and its waters are also used for scouring the outer harbour by sluices. It is 1,520 feet in length, 500 feet in breadth at the centre, and 350 feet at either end, and carries from 14 to 10 feet water. It contains a patent slip; also a dry dock, 143 feet in length, 40 feet in breadth, 33 feet wide at entrance, 11 feet water over sill at high-water springs, and 8 feet at neaps, but the depth is entirely dependent upon the prevailing winds.

The inner harbour is entered by single gates, as great dispatch is required when vessels are driven in bad weather; and when there are many vessels in it, the gates are kept close to keep them afloat, as accidents may occur by those of unequal draught grounding alongside each other, or by falling over and getting damaged by the hard chalky bottom. The eastern entrance is 29½ feet, and the western entrance 40 feet wide, and the depth over the sills is 14 feet at high-water springs, and 12 feet at neaps with northerly winds, but 2 feet less with southerly winds.

In 1879 there were 202 vessels belonging to the port, whose total

registered tonnage amounted to 7,711 tons. The population of Ramsgate is about 23,000.

Life Boats.—Two life boats are stationed at Ramsgate, and in bad weather they are placed on the deck of one of the steam tugs belonging to the port, ready for immediate service.

LIGHTS.—The stone lighthouse on the western pier head at Ramsgate exhibits, at an elevation of 38 feet above high water, a *fixed red* light while there are 10 feet water and upwards between the pier heads, or from about 2¾ hours before until 3½ hours after high water; and in the daytime the same depth is indicated when a red ball is hoisted on the cliff near Jacob's ladder. When less than 10 feet between the pier heads, a *green* light is shown instead of the red.

A *green* light is also shown upon the west cliff for the purpose, when in line with the tide light in the lighthouse, of leading in the best water through Old Cudd channel. Another *green* light is shown from the east cliff, and when kept in line with the pier light will lead in the best water from the Middle Fairway buoy.

A *flashing* scintillating white light is also exhibited from the east pier, at an elevation of 25 feet above high water, and illuminates an arc of 224 degrees, or from the direction of the Dike buoy round to the centre of the basin gates of west entrance to inner harbour. The light shows a *flash* for *five seconds*, and is then followed by an equal interval of darkness, by which it will readily be distinguished from the town lights behind.

RAMSGATE ROAD.—The anchorage off Ramsgate is good with northerly winds between N.W. by W. and N.E. by N.; but with southerly, or easterly winds a cross sea gets up, which, with a strong flood, makes it an uneasy roadstead. Anchor with Ramsgate church and lighthouse in line, and Cliff-end farm on with Cliff-end in about 15 feet at low water over chalk bottom, or farther inshore, according to the vessel's draught; but if drawing more than 12 feet, anchor in Ramsgate hole, in 18 feet over clay bottom, which is easily found by bringing Minster mills in line with Cliff-end, and St. Lawrence church just open eastward of the two mills and square tower on the west cliff.

Tides.—It is high water, full and change, at Ramsgate, at 11h. 20m.; ordinary springs rise 15 feet, neaps 12 feet; but these depths are increased 2 feet with northerly winds. The time and duration of high-water level are much accelerated or retarded by prevailing winds; northerly winds rising the level rapidly on the flood, and causing it to hold up on the ebb in an extraordinary degree, whilst southerly winds are as decisive in creating contrary results.

About 2½ hours before high water in the harbour the stream begins to set to the north-east, without the pier heads, and it continues in that direction for 5½ hours. About one hour after the ten-feet signal is made, there are 16 feet water with spring tides between the pier heads; and at two hours after, or at high water, there are 20 feet. With neap tides, one hour after the signal is made, there are 12 feet between the pier heads, and at two hours after, or at high water, there are 15 feet.

DIRECTIONS.—Running for Ramsgate from the Small Downs with a S.W. gale, weigh before the tide has done running to the southward, and steer so as to pass to the eastward of the South Fairway buoy, and thence for the Middle Fairway buoy, from which Ramsgate lighthouse N.N.E. ¾ E. will lead to the entrance: at night the *red* light on the west pier, and *green* light on east cliff will be in one, on the same line of bearing.

The best time to enter if the vessel be not drawing more than 10 feet is two hours before high water, or when the tide begins to set to the north-east outside the pier heads. Pass close to the west pier head, taking care to keep a large diamond guide mark—white upon a black ground—on the landing platform full in view until the vessel is within the entrance.

If, when approaching the entrance, the tide is setting to the north-eastward, keep good sail on and close the North Fairway buoy, and steer for the west pier head—the vessel cannot be too close,—and if there is not time to run a warp to one of the buoys within the harbour, throw all aback, and let go the anchor; if no anchor, run the vessel on the East bank, directly towards the pier house.

Several vessels have narrowly escaped destruction by running for the harbour under insufficient sail to give them proper steerage way, and by keeping too far from the North Fairway buoy; thus crossing the stream of tide, instead of coming to the entrance before it.

Whilst the buoys are in position they will form the best guides for the channel, but a good leading mark is St. Lawrence church, appearing about one quarter of the distance from West Cliff lodge towards Pugins tower, N. ¾ E., until Ramsgate lighthouse bears N.N.E. ¾ E., when alter course for it, always taking care to avoid being carried past the entrance to the eastward.

As there are no good clearing marks for the west side of the Brake sand, vessels should not attempt to work through Ramsgate channel without local knowledge; for although the steep inner edge of this danger is generally marked by a ripple, no seaman would be justified in trusting the safety of his ship to such natural causes.

At Night vessels should not attempt to run for Ramsgate, except in case of extreme necessity; and to do this they should know their exact

position before dark, with the bearing and distance of the South Fairway buoy. They should also keep a good look-out for, and note the time the 10-feet water signal is made. The safest way is to run out through the Gull stream.

Should, however, a vessel from sheer necessity be compelled to run for Ramsgate from the Small Downs, a course should be shaped for the South Fairway buoy, and when abreast it (the Gull Stream light-vessel will bear about S.E. by E. ½ E.) steer for the Middle Fairway buoy, and when the *green* lights on east cliff and east pier are in line, N.N.E., steer for them or borrow to the westward so as to bring the *red* or *green* light on the west pier in line with the *green* light on east cliff, N.N.E. ¾ E.; both will lead towards the harbour's mouth. If the tide be running to the eastward, take care not to bring the light to the northward of N.N.E. ¾ E. till the vessel almost touches the pier head, or she will be set to the eastward past the entrance.

OLD CUDD CHANNEL is the narrow passage between the Quern and the Dike, and carries a depth of 8 feet at low-water springs. There is no difficulty in navigating this channel as a chequered black and white buoy marks the north end of the Quern, and a black buoy the south end of the Dike. To approach it by day, bring Mr. Pugin's house—which has a square tower and stands on the west cliff—its apparent breadth open south of the pier N.W. by W. ½ W.; steer with these marks on between the buoys, and then W. by N. for the North Fairway buoy, and when Ramsgate church comes on with the end of the chalk cliff, or the diamond patch comes open of the west pier the vessel may steer for the harbour.

The leading mark through the channel *at night* when there is less than 10 feet water at the entrance of the harbour is the *green* light on the west cliff in line with the *green* light in the lighthouse; but when there are 10 feet and upwards at the entrance of the harbour, the *green* light in the lighthouse is not shown, and then the *green* light on the west cliff and the *red* light in the lighthouse will lead through the channel.

This channel cannot be recommended to sailing vessels *at night* during an ebb tide, as it is attended with considerable risk, for, when the western tide makes—at half ebb—it does not set fair through the channel, but shoots across it on to the outer shoal, and if a vessel be not quick with her helm she is on shore; this is continually happening with fishing vessels and small coasters; the cause is obvious, for the inner shoal curving off from the shore throws the tide obliquely across the channel.

Broadstairs, a small but pleasantly situated watering place, about 2 miles north-east of Ramsgate, has a small harbour, formed by a pier

extending from the northern side of the cove. The entrance faces the south-west, and is much exposed to the sea driven in by easterly winds. There are 16 feet at the pier end at high-water springs, and 10 feet at neaps, but the harbour dries out at low tide.*

Life Boats.—Two life boats are stationed at Broadstairs, and one at Kingsgate.

Signals.—A signal station is established at Broadstairs; vessels making their numbers by the commercial code of signals are reported.

TIDAL STREAMS.—It has already been observed in page 12 that the Channel streams at each end of Dover strait set uniformly in a direction towards Dover while the water is rising at that place, and away from it when it is falling. A vessel, therefore, if she carries the eastern stream or flood as far as Hastings, will have a continuation of easterly tide for 4 hours longer, and if sailing 8 knots, will nearly carry it to the North Foreland. If turning to windward, and she can get to the eastward of Hastings by high water, she may then advance as far as the West road, Dungeness, before the tide makes to leeward; but if not to windward of Hastings by an hour after high water, she will get no farther, and may either keep under weigh or anchor for the tide, as convenient.†

Accidents of a fatal nature have occurred to ships running up channel by being lost on the coast of France, in the vicinity of Boulogne, which have been attributed to the rotary action of the stream; but there is more reason to believe that they have been set to the eastward of their reckoning, and deeming themselves westward of Dungeness, have been steering East whilst they have been 10 miles beyond it, when probably the stream to the S.W. has begun to run, and catching them on the port bow, has set them over on the French shore (*see* page 13). The mariner therefore will do well to study the set and turning of the stream given for every hour in pages 280 and 281, and on no account to neglect the lead.

It is high water, full and change, at Beachy head, at 11h. 20m.; springs rise 20 feet, neaps 15 feet. The stream in the offing begins to run to the eastward at low water, and continues to do so until high water, a similar law applying to the western stream.

It is high water, full and change, at Eastbourne, at 11h. 3m.; springs rise 21¼ feet, neaps 17 feet; at Hastings at 10h. 53m., rise 24 feet and

* Directions for navigating between the North Foreland and the Nore are given in North Sea Pilot, Part 3, east coast of England, chapter 9.

† This description of the tidal streams in Dover strait is by Captain F. Bullock, R.N., 1848.

17½ feet; Dungeness at 10h. 45m., rise 21¾ feet and 19 feet; and Boulogne at 11h. 25m., rise 25 feet and 19½ feet.

It is high water, full and change, on the Varne and Ridge, at 10h. 40m.; but the north-eastern stream does not commence there until 4½ hours flood, nor the western stream till 4¾ hours ebb; making 6½ hours of north-eastern and 5½ hours of south-western tide.

Strong gales from the westward will prolong the north-eastern stream nearly an hour, and retard proportionably that to the south-westward; so that on some occasions, on the Ridge especially, 8 hours north-eastern tide, and only 4 hours to the south-westward, have been found.

Between the Vergoyer and the French shore the tide makes on an average one hour sooner than it does in the offing, both on the ebb and flood.

From Dover to Hastings the duration of the flood is always considerably less than the falling tide, the former flowing 5¼h., and the latter ebbing 7h.; but to the westward of Hastings, at Eastbourne, the duration of the two tides begins to equalize, the tide flowing 5h. 45m., and ebbing 6h. 40m.

Inshore, between Hythe and Dungeness, there will be found a slack during the strength of the eastern stream; also from Hastings to Beachy head the flood runs easy. During the western stream the tide is easy between Hythe and Sandgate as far as Mill point; and between Dungeness and Fairlight there is a slack which might be taken advantage of. Between Pevensey bay and Holywell bank the western stream commences at half an hour before high water; and over the bank and in Whitbread hole, there is a strong eddy setting down after half flood.

About one mile S.S.E. of the South Foreland lighthouse, the stream begins to set to the eastward about 1h. 30m. before high water on the shore at Dover, and runs from N.E. by E. to E.N.E. about 5½ hours, or till 4 hours after high water; it then turns and sets W. by S. ¾ S. about 7 hours. At Dover the flowing stream seldom continues more than 5 hours, and sometimes scarcely so much; it is nearly the same at Ramsgate. To the northward of the South Foreland the streams change their direction to N.E. ½ N. and S.W. ½ S.

In the Downs the north-eastern stream begins about 1h. 20m. before high water at Dover, and continues to run 5h. 30m.; it then turns and runs in a contrary direction till 2 hours before the ensuing high water.

In the Gull stream one mile N.N.W. from the Bunt head, the northern stream begins about 1h. 10m before high water at Dover, and continues

for 6 hours; it then turns and runs in a contrary direction until 1½ hours before the ensuing high water; its direction is N.E. ¾ N.; but the last hour changes to E.N.E., and even to the southward of East; the last hour of the southern stream changes from S.W. ¾ S. to W.S.W., and even to the northward of West.

TABLE OF POSITIONS

ON THE

SOUTH-WEST AND SOUTH COASTS OF ENGLAND, AND ON THE NORTH COAST OF FRANCE.

SOUTH-WEST AND SOUTH COASTS OF ENGLAND.

Place.	Particular Spot.	Latitude, North.			Longitude.		
		°	′	″	°	′	″
Trevose head	Lighthouse	50	32	55	5	2	3W
Godrevy island	Lighthouse	50	14	0	5	24	0
St. Ives	Lighthouse on pier head	50	12	0	5	28	0
Longships rocks	Lighthouse	50	4	4	5	44	44
Bishop rock	Lighthouse	49	52	30	6	26	36
St. Agnes island (Scilly)	Lighthouse	49	53	33	6	20	38
Seven Stones	Light vessel	50	3	37	6	4	37
Wolf rock	Lighthouse	49	56	43	5	48	27
Runnelstone	Summit	50	1	26	5	40	18
Mount St. Michael's	Summit	50	7	3	5	28	37
Lizard head	Eastern lighthouse	49	57	34	5	12	4
Falmouth	Turret of Pendennis castle.	50	8	44	5	2	45
Dodman point	Extreme	50	13	15	4	48	2
Gribben head	Beacon	50	19	0	4	40	20
Looe island	Summit	50	20	17	4	27	0
Rame head	Extreme	50	18	42	4	13	22
Eddystone rock	Lighthouse	50	10	49	4	15	53
Plymouth sound	Dial on breakwater	50	19	59	4	8	52
" "	Signal staff in redoubt on Mount Wise.	50	22	0	4	10	15
Bolt head	Summit	50	13	10	3	48	45
Start point	Lighthouse	50	13	18	3	38	28
Dartmouth	St. Petrox church	50	20	30	3	33	55
Berry head	Summit	50	23	56	3	28	56
Torquay	Lighthouse on pier head	50	27	30	3	31	0
Teignmouth	Lighthouse on Denn	50	32	35	3	29	36
Exmouth	Church	50	37	0	3	24	40
Bill of Portland	Upper lighthouse	50	31	18	2	27	18
Weymouth	Beacon on pier head	50	36	23	2	26	20
St. Albans head	Extreme	50	34	30	2	3	10
Poole	Church	50	42	46	1	59	18
Needles rock	Lighthouse	50	39	40	1	35	27
St. Catherine point	Lighthouse	50	34	30	1	17	47
Portsmouth harbour	Semaphore in dockyard	50	48	0	1	6	15
Owers shoals	Light-vessel	50	38	50	0	40	0
Brighton	Pier head	50	49	0	0	8	0
Newhaven	West pier head	50	47	0	0	3	25W
Beachy head	Lighthouse	50	44	15	0	12	58 E
Dungeness	Lighthouse	50	54	47	0	58	18
Folkestone	Lighthouse	51	4	45	1	11	35
Varne Shoal	Light-vessel	50	56	18	1	16	20

SOUTH-WEST AND SOUTH COASTS OF ENGLAND—*cont.*

Place.	Particular Spot.	Latitude, North.			Longitude.		
		°	′	″	°	′	″
Dover	Castle	51	7	45	1	19	22E
South Foreland	Lighthouses	51	8	23	1	22	22
Deal Castle	Centre	51	13	9	1	24	20
South Sand Head	Light-vessel	51	9	55	1	28	10
North Sand Head	Light-vessel	51	19	23	1	35	27
Ramsgate	Lighthouse on west pier	51	19	42	1	25	23
North Foreland	Lighthouse	51	22	28	1	26	48
NORTH COAST OF FRANCE.*							
Ile D'Ouessant or Ushant	North-east lighthouse	48	28	31	5	3	32W
Ile Vierge	Lighthouse	48	38	23	4	34	11
Ile de Bas	Lighthouse	48	44	45	4	1	44
Les Sept Iles	Lighthouse	48	52	46	3	29	33
Les Héaux de Bréhat	Lighthouse	48	54	33	3	5	17
Ile Bréhat	Lighthouse on Paon point.	48	51	58	2	59	17
Iles Saint Quay	Lighthouse on Harbour island.	48	40	2	2	48	37
Cap Frehel	Lighthouse	48	41	5	2	19	14
Saint Malo	Lighthouse on Mole des Noires.	48	38	40	2	1	53
Herpin rock	Summit	48	43	18	1	49	55
Mont Saint Michel	Telegraph	48	38	12	1	30	46
Roc de Granville or cap Lihou	Lighthouse	48	50	7	1	36	52
Isles Chausey	Lighthouse on S.E. point of Grand Ile.	48	52	13	1	49	26
Plateau des Minquiers	Maitresse Ile	48	58	17	2	3	52
Jersey island	Grande Anquette beacon	49	8	22	1	55	18
,,	Seymour Tower	49	9	30	2	0	34
,,	Ruin on Cape Grosnez	49	15	29	2	14	53
,,	Lighthouse on Victoria pier, St. Helier.	49	10	33	2	7	18
Guernsey island	Jerbourg tower	49	25	40	2	32	10
,,	Lighthouse on Hanois or Hanoveaux rocks.†	49	26	2	2	42	10
,,	Castle Cornet†	49	27	4	2	31	38
,,	St. Peter Port, light-house.†	49	27	14	2	32	5
Alderney island	St. Anne's church	49	42	54	2	12	15
,,	Ortach rock	49	43	27	2	17	33
,,	Alderney mill†	49	42	26	2	12	46
,,	Braye harbour light	49	43	20	2	12	6
Casquets islets	Lighthouse†	49	43	17	2	22	42
Régneville	Lighthouse on Agon point.	49	0	32	1	34	56
Le Senequet	Lighthouse on summit	49	5	32	1	39	49
Le Bœuf	Summit	49	6	36	1	47	16
Cap de Carteret	Lighthouse	49	22	27	1	48	31
Cap de Flamanville	Guardhouse	49	31	23	1	53	0
Nez de Jobourg	Extreme	49	40	33	1	56	54
Cap de la Hague	Lighthouse on Gros du Raz rock.	49	43	22	1	57	21

* The positions on the French coast are from the *Pilote Français*, except those marked †, which are by Staff Commander John Richards, R.N.

NORTH COAST OF FRANCE—*cont.*

Place.	Particular Spot.	Latitude, North.			Longitude.		
Cherbourg - - - -	Lighthouse in fort Querqueville.	49	40	20	1	41	9W
„ - - - -	Fort Central on break-water.	49	40	28	1	37	14
Cap Levi - - - -	Lighthouse - -	49	41	40	1	28	28
Cap de Barfleur - - -	Lighthouse - -	49	41	50	1	16	2
Tour de la Hougue - -	South extreme of fort	49	34	19	1	16	27
Iles Saint Marcouf - - -	Lighthouse - -	49	29	55	1	8	52
Grand Camp - - - -	Lighthouse - -	49	23	25	1	2	36
Point de Ver - - - -	Lighthouse - -	49	20	28	0	31	14W
Le Havre - - - -	Lighthouse on N.W. jetty.	49	29	0	0	6	4E
Cap de la Hève - - -	Lighthouse - -	49	30	43	0	4	2
Cap d'Antifer - - -	Summit - - -	49	41	17	0	9	46
Fécamp - - - - -	Lighthouse on Fagnet point.	49	46	5	0	22	6
Pointe d'Ailly - - -	Lighthouse - -	49	55	7	0	57	29
Dieppe - - - - -	Lighthouse on west jetty	49	56	2	1	4	57
Cayeux - - - - -	Lighthouse - -	50	11	42	1	30	41
Cap d'Alprech - - -	Lighthouse - -	50	41	57	1	33	41
Boulogne - - - -	Lighthouse on S.W. jetty.	50	43	56	1	35	5
Cap Grisnez - - -	Lighthouse - -	50	52	10	1	34	56
Calais - - - - -	Lighthouse - -	50	57	45	1	51	7
Gravelines - - - -	Lighthouse - -	51	0	18	2	6	29
Dunkerque - - - -	Lighthouse - -	51	3	0	2	22	39

Showing the Time of HIGH WATER on Full and Change Days, with the rise at Springs and Neaps above the Mean Low Water Level of Ordinary Spring Tides, at the Principal Places on the SOUTH-WEST and SOUTH COASTS of ENGLAND.

Place.	High Water, Full and Change.	Rise.	
		Springs.	Neaps.
	h. m.	ft.	ft.
Scilly Islands,			
„ St. Agnes	4 30	16	12
„ St. Mary's	4 18	15¾	11¾
Newquay harbour	4 59	21	15
Portreath „	4 51	21	15
St. Ives „	4 44	21	15
Longships - -	4 35	20	14
Mounts bay -	4 30	16	12½
Lizard - -	5 0	14¼	10⅓
Coverack cove -	4 35	14½	11¼
Falmouth harbour	4 57	16	12
Truro (town quay)	5 5	10	6
Mevagissey harbour.	5 4	15½	12
Fowey harbour -	5 14	16	13½
East Looe - -	5 26	16	13
Plymouth breakwater.	5 37	15½	11½
Devonport dockyard.	5 43	15½	11½
River Tamar:			
Saltash -	5 45	15	11
Cargreen -	5 47	14¾	10¾
Pentillie -	5 55	13½	9⅓
Calstock -	6 6	12½	8½
Morwellham	6 12	10⅔	6½
Weir head -	6 17	5¼	1¼
River Tavy:			
Warleighquay	5 47	14½	10½
Maristow	5 47	8½	4½
Bigbury bay:			
River Yealm	5 37	16¼	11½
„ Erme	5 40	16¼	11½
„ Avon	5 47	16¼	11⅔
Bolt head - -	5 45	15?	11?
Salcombe harbour	5 41	15	11½
Eddystone lighthouse.	5 15	16	12
Start point -	5 41	15	11½
Dartmouthharbour	6 16	14¼	10½
Teignmouth -	6 0	13	9½
Torbay - -	6 0	13½	10
Exmouth - -	6 21	12¼	8½
Lyme Regis harbour.	6 21	11½	8½
Bridport harbour	6 5	11¼	7¾
West bay, Chesilton.	6 13	10¼	7
Portland bill -	6 35	9	6⅓
„ breakwater.	7 1	6¾	4½
Poole harbour -	9 10 / 0 45	6½	4¾

Place.	High Water, Full and Change.	Rise.	
		Springs.	Neaps.
	h. m.	ft.	ft.
Christchurch harbour.	9 0 / 11 30	5	—
Needles point -	9 46	7½	5
Atherfield point -	10 20	8½	7
Hurst - -	10 0 / 12 0	7½	6
Yarmouth -	10 0 / 12 0	7	6½
Cowes harbour -	10 45 / 11 45	12½	9½
Ryde pier - -	11 20	13½	10
Calshot point -	11 30	13	9½
Southampton -	10 30 / 0 45	13	9½
Portsmouth harbour:			
Dockyard -	11 41	12¾	10
Off Porchester castle.	11 45	13½	10¼
One third of a mile west of Portsbridge.	11 48	6½*	4*
In channel close to Fareham upper quay.	11 47	11¼	8½
Fareham bridge	11 51	7½	4¾
Bembridge point-	11 0	14	10½
Langston harbour	11 41	13½	10½
Chichester „	11 30	14	11
Pagham (entrance)	11 30	16½	12½
Selsea bill - -	11 45	16½	12½
Little Hampton -	11 36	16	11⅔
Arundel (bar) -	11 35	16	11½
„ (town) -	0 25	16	11⅔
Shoreham harbour	11 34	18	13¼
Brighton - -	11 15	19¾	16
Newhaven harbour.	11 51	20	15
Beachy head -	11 20	20	15
Eastbourne -	11 3	21¼	17
Hastings - -	10 53	24	17½
Rye bay - -	11 20	22	17¼
Dungeness - -	10 45	21¾	19
Folkestone harbour.	11 7	20	16½
Dover harbour -	11 12	18¾	15
Deal - - -	11 15	16	12½
Ramsgate harbour	11 20	15	12

* Above the bed of the channel.

TABLE showing the Principal Dimensions of Private Graving Docks, &c. in the different Harbours on the SOUTH-WEST and SOUTH COASTS OF ENGLAND.

Name of Port.	Graving Docks.				Patent Slips.	Grid-irons.	Rise of Tide.	
	No.	Length over all.	Breadth of Entrance.	Depth over Sill at High-Water Ordinary Springs.			Springs.	Neaps.
		ft.	ft.	ft.	No.	No.	ft.	ft.
Hayle	1	250	48	15½	—	—	18⅓	12⅔
Penzance	1	250	40	13	—	—	16	12⅔
Falmouth	2	400 350	65 50	16 14	2	—	16	12
Plymouth, Catwater	1	250	50	18½				
„ Sutton Pool	1	144	37	10	3	—	15½	11½
„ Mill Bay	1	367	80	22				
Dartmouth	—	—	—	—	2	—	14	10
Teignmouth	—	—	—	—	2	—	13	9½
Exmouth, Topsham	1	190	32	10	—	—	11¼	8½
„ Exmouth	1	240	34	12	—	—	12½	8¼
Weymouth	—	—	—	—	2	—	6¾	4½
Southampton	4	450 426 395 251	56 80 66 51	25 25 21 15	—	—	13	9½
Cowes	2	330 140	56 36	16½ 12½	1	—	12½	9½
Portsmouth, Town Camber.	1	345	50	17¼	—	—	12¾	10
„ Inner Camber.	—	—	—	—	1	—	„	„
Shoreham	—	—	—	—	1	—	18	13¼
Newhaven	—	—	—	—	—	1	20	15
Rye	—	—	—	—	1	—	15½	10¼
Folkestone	—	—	—	—	1	1	17	13
Dover	—	—	—	—	1	—	18¾	15
Ramsgate	1	148	33	11	1	—	15	12

TABLE* showing the MAGNETIC DIRECTION of the TIDAL STREAMS in the CHANNEL at every HOUR of the TIDE at DOVER.

Westward of a Line joining Ushant and the Land's End.

Hours.	North Side of Lat. 49° N.						South Side of Lat. 49° N.	
	West part.	Rate.	Near Scilly.	Rate.	Seven Stones.	Rate.	West part.	Rate.
After High Water, Dover. 1	W. by N. ½ N.	Greatest rate, springs, 1½ knots.	N.N.W. ½ W.	Greatest rate, springs, 1½ knots.	N. ½ W.	Greatest rate, springs, 1·6 knots.	W. ½ S.	Greatest rate, springs, 1½ knots.
After High Water, Dover. 2	N. ½ W.		N. ½ W.		N.N.E.		N. by W. ½ W.	
After High Water, Dover. 3	N.E. ½ E.		N.N.E.		N.E. ½ N.		E. by N. ½ N.	
After High Water, Dover. 4	E. by N. ½ N.		„		N.E. ½ E.		„	
After High Water, Dover. 5	„		N.E. by E.		N.E. ½ E.		N.E. by E. ½ E.	
After High Water, Dover. 6	E. ½ S.		E. ½ S.		E. by N. ½ N.		Turning.	
Before High Water, Dover. 5	S.E. by E. ½ E.		- - - -		S. ½ W.		S. by E. ½ E.	
Before High Water, Dover. 4	S. ½ E.		South.		S.S.W. ½ W.		Draining.	
Before High Water, Dover. 3	S.S.W. ½ W.		S.W.		S.S.W. ½ W.		S.W. ½ W.	
Before High Water, Dover. 2	S.W. by W.		S.W. by W.		S.W. ½ S.		S.W. ½ S.	
Before High Water, Dover. 1	W. by S. ½ S.		„		W.S.W.		S.W. by W. ½ W.	

Between { A Line joining the Land's End and Ushant,
„ „ the Start and Casquets, and
„ „ the Casquets and Sept Iles.

Hours.	North Side of Channel.						South Side of Channel.					
	West part.	Rate.	Centre.	Rate.	East part.	Rate.	West part.	Rate.	Centre.	Rate.	East part.	Rate.
After High Water, Dover. 1	W. by N. ½ N.	Greatest rate, springs, 2 knots.	W. ½ N.	Greatest rate, springs, 1½ knots.	W. ½ N.	Greatest rate, springs, 2½ knots.	W. ½ S.	Greatest rate, springs, 1½ knots.	W. ½ N.	Greatest rate, springs, 1½ knots.	W. ½ S.	Greatest rate, springs, 2 knots.
After High Water, Dover. 2	Turning.		N.W. by W. ½ W.		W. ½ N.		Slack.		West.		W. by S.	
After High Water, Dover. 3	N. ½ E.		W. ½ N.		West.		East.		Slack.		W.S.W.	
After High Water, Dover. 4	E. ½ S.		Slack.		S. ½ W.		E. by N.		E. by S. ½ S.		S.E. by S.	
After High Water, Dover. 5	East.		E. ½ S.		S.E. ½ S.		E. by N. ½ N.		E. ½ S.		S.E. by E. ½ E.	
After High Water, Dover. 6	E. by S.		„		E. by S. ½ S.		E. ½ N.		S.E. by E. ½ E.		S.E. ½ S.	
Before High Water, Dover. 5	E. by S. ½ S.		E. by S.		E. by S.		E. ½ S.		E. by S.		E. by S. ½ S.	
Before High Water, Dover. 4	Slack.		E. by S. ½ S.		E. ½ S.		N.E. by E. ½ E.		Slack.		E. ½ N.	
Before High Water, Dover. 3	Turning.		Slack.		E. ½ S.		Slack.		W.N.W.		North.	
Before High Water, Dover. 2	W. by N.		W. ½ N.		Turning.		S.W. by W. ½ W.		Slack.		W. by N. ½ N.	
Before High Water, Dover. 1	W. ½ S.		„		W. by S. ½ S.		S.W. by W.		W. by N.		N.W. ½ W.	

Between { A Line joining the Start and Casquets, and
„ „ Beachy Head and Pointe d'Ailly.

Hours.	West part.	Rate.	Centre.	Rate.	East part.	Rate.	Over Hurd's Deep.	Rate.	Off Cape Barfleur.	Rate.
After High Water, Dover. 1	W. ½ N.	Greatest rate, springs - flood 2·3 knots, ebb 2·4	W. by N. ½ N.	Greatest rate, springs - flood 3·6 knots, ebb 3·3	Turning.	Greatest rate, springs - flood 3·00 knots, ebb 2·40	W. ½ S.	Greatest rate, springs - flood 2·15 knots, ebb 2·40	N.W.	Greatest rate, springs - flood 5·4 knots, ebb 5·2
After High Water, Dover. 2	W. by N. ½ N.		N.W. by W. ½ W.		W. by N. ½ N.		„		„	
After High Water, Dover. 3	W. ½ N.		„		W. by N. ½ N.		W. ½ S.		„	
After High Water, Dover. 4	W. ½ S.		W.N.W.		W. ½ N.		W.S.W.		„	
After High Water, Dover. 5	„		„		W. by N.		W. by S. ½ S.		„	
After High Water, Dover. 6	N.N.E. ½ E.		W. by N. ½ N.		„		Slack.		„	
Before High Water, Dover. 5	E. ½ S.		E.S.E.		E. by S. ½ S.		E. ½ S.		„	
Before High Water, Dover. 4	E. by S. ½ S.		S.E. by E. ½ E.		E. by S. ½ S.		„		„	
Before High Water, Dover. 3	„		„		E. by S. ½ S		E. ½ S.		S.E.	
Before High Water, Dover. 2			„		„		E. ½ N.		„	
Before High Water, Dover. 1	„		E.S.E.		E. ½ S.		E.N.E.		„	

* In this Table the time of high water at Dover is taken as a standard, so that to find either the time of the turn or the direction of the stream in the channel, compare the mean time of ship with the time of high water at Dover, and the interval between in the column answering to the ship's position will be found the information required. The description of the Tidal Streams is given in page 12.

Entrance of gulf of St. Malo on a line joining Ile Brehat and S.W. side of Guernsey Island.

Hours.		12 miles from Brehat. Course.	Rate.	12 miles from Guernsey. Course.	Rate.	Near S.W. point of Guernsey. Course.	Rate.	4 miles W. by S. from Casquets. Course.	Rate.	4 miles W.N.W. of cape de la Hague. Course.	Rate.
After High Water, Dover.	1	N.W. by W.	Uncertain.	W. ½ N.	Uncertain.	W. ½ N.	Uncertain.	W. ½ S.	Uncertain.	S.W. by W. ½ W.	Greatest rate, springs, 5 to 7 knots.
	2	S. ½ W.		S. ½ W.		S.S.W. ½ W.		S.W. ½ W.		„	
	3	S. ½ W.		S. ½ W.		„		„		„	
	4	S.E. ½ S.		S.S.E. ½ E.		S.E. by E. ½ E.		S. by E. ½ E.		S.W. ½ S.	
	5	„		S.E. ½ E.		„		S.E. ½ E.		„	
	6	S.E. ½ S.		S.E. ½ S.		„		„		N.E. by E. ½ E.	
Before High Water, Dover.	5	S.E. ½ E.		S.E. by E.		S.E. by E. ½ E. E. ½ N.		E. ½ N.		„	
	4	..		..		S.E. by E. ½ E. E. ½ N.		N.E. ½ N.		„	
	3	N.W. by W.		N.W. ½ N.		..		„		N.E. ½ N.	
	2	„		N.W. ½ W.		N. by W. ½ W.		N.E. by E. ½ E.		„	
	1	N.W. ½ W.		W. by N. ½ N.		„		N.W. ½ W.		„	

In the Baie de la Seine, south of a line joining cape Barfleur and cape Antifer.

Hours.		West part.	Rate.	Centre.	Rate.	East part.	Rate.
After High Water, Dover.	1	N.N.W. ½ W.	Greatest rate, springs - flood 4·2 ebb 3·7 knots.	N.W. by W. ½ W.	Greatest rate, springs flood 3·2 ebb 3·2 knots.	W. ½ N.	Greatest rate, springs flood 3·3 ebb 3·0 knots.
	2	N.N.W. ½ W.		„		W. ½ S.	
	3	N.N.W.		„		W. by N. ½ N.	
	4	N.N.W. ½ W.		„		W. ½ N.	
	5	„		N.W. by W. ½ W.		„	
	6	Slack.		„		W. ½ S.	
Before High Water, Dover.	5	S.S.E.		S.E. by E. ½ E.		„	
	4	„		„		E. by N. ½ N.	
	3	„		„		E. by N. ½ N.	
	2	S.E. by S.		„		„	
	1	„		„		„	

Between { A line joining Beachy Head and Pointe d'Ailly, and „ the North Foreland and Dunkerque.

Hours.		Remarks.	West of Line of Separation.	East of Line of Separation.	South Sand Head. Course.	South Sand Head. Rate.	North Sand Head. Course.	North Sand Head. Rate.
After High Water, Dover.	1	The tides separate on a line joining Beachy Head and St. Valery	W. by N.	N.E. by E. ½ E.	N.E. ½ E.	Greatest rate, springs, 3·3 knots.	N.N.E.	
	2	„ Hastings and Treport	W. ½ N.	„	N.E. ½ E.		„	
	3	„ Hastings and Caveux	W. ½ N.	E.N.E.	N.E. by E. ½ E.		N.E. ½ E.	
	4	„ Folkestone and Calais	W. by S.	„	N.E. by E. ½ E.		E. by S.	
	5	„ South Foreland and Gravelines	S.W. by W. ½ W.	N.E. by E. ½ E.				
	6	„ Ramsgate and Nieuport, passing over North Sand Head, the south line of the Falls, and the banks off Nieuport	W. by S.	{ E. ½ N. and Northward.	S.W. ½ S.		S.S.W.	
Before High Water, Dover.		The tides meet on a line joining	Line of meeting.					
	5	Beachy Head and Pointe d'Ailly	E.S.E.	S.W. by W. ½ W.	S.W.		„	
	4	„ Bexhill and Caveux, both streams turning down towards the River Somme	S.S.E. ½ E.	S. by W. ½ W.	S.W. ½ W.		„	
	3	„ Rye and the Somme, passing over the Bassurelle, both tides setting to the Somme	S.E. by E. ½ E.	S.W. by W.	W. by S. ½ S		„	
	2	„ Dungeness and Touquet point	E. by N.	W. by S. ½ S.	W. ½ N.		„	
	1	„ Dover and Dunkerque nearly	N.E. by E. ½ E.	W.S.W.	N.N.E.		„	

APPENDIX.

ISLE OF WIGHT—PROHIBITED ANCHORAGES.

It is enacted by Her Majesty's Order in Council, dated 3rd May 1882—in accordance with "The Solent Navigation Act, 1881"—that vessels are prohibited from anchoring within a certain space extending from the north end of Ryde pier; as also within a certain space in Cowes road and harbour.*

RYDE—PROHIBITED ANCHORAGE.

The space within which vessels are prohibited from anchoring off the north end of Ryde pier, is defined in the following manner:—

On the North—by lines joining four buoys, numbered respectively (commencing from the eastward) 6, 1, 2, 4.

On the South—by lines joining respectively the north-east and north-west extremities of Ryde pier, with buoys numbered 5, 3.

Buoy No. 1—*can, chequered red and white*—is moored in 2¼ fathoms, 600 feet N.E. ½ N. from angle of pier under the green light on the pier head.

Buoy No. 2—*can, red*—is moored in 2¼ fathoms, 600 feet N.N.W. ½ W. from the angle of pier under the white light on pier head.

Buoy No. 3—*can, chequered red and white*—is moored in 2½ fathoms, 2,000 feet N.W. from the inner west corner of pier head, with Spit fort bearing E. by N. ¼ N., and Trinity church spire, Ryde, S. by E.

Buoy No. 4—*can, red*—is moored in 3¼ fathoms, 300 feet N.E. from buoy No. 3.

Buoy No. 5—*red with bell*—is moored in 4¾ fathoms, 2,000 feet E. by N. ½ N. from the eastern inner corner of pier head, with Trinity church spire, Ryde, bearing S.W. by S., and Osborne North tower N.W. by W. ¾ W.

Buoy No. 6—*can, chequered red and white*—is moored in 4 fathoms, 400 feet N. by W. ½ W. from buoy No. 5.

COWES ROAD AND HARBOUR—PROHIBITED ANCHORAGE.

The space within which vessels are prohibited from anchoring in Cowes road and harbour, is defined in the following manner:—

On the East—by lines joining four chequered buoys, numbered respectively (commencing from the northward) 1, 3, 5, 7; and farther by a line joining buoy No. 7 with the northern end of Trinity pier, East Cowes.

* Originally published in Notice to Mariners No. 117 of 1882.

On the West—by lines joining four red buoys, numbered respectively (commencing from the northward) 2, 4, 6, 8; and farther by a line joining buoy No. 8 with the buoy (to be coloured *red*) north-eastward of Thetis dock, West Cowes.

Buoy No. 1—*red and white chequered with cage*—is moored in 10 fathoms, 1,310 feet W. by N. ½ N. from Prince Consort buoy, with east extreme of Royal Yacht Club house in line with St. Mary's church tower, West Cowes, bearing S.W. by S., and Notice board on Shrape mud S. by E. ½ E.

Buoy No. 2—*can, red*—is moored in 8¼ fathoms, 800 feet W. by N. ½ N. from buoy No. 1, with east extreme of Trinity church, West Cowes, in line with St. Mary's church tower, bearing S. by W. ¾ W., and Notice board on Shrape mud S.S.E. ¼ E. (nearly).

Buoy No. 3—*can, red and white chequered*—is moored in 10 feet, with the north flagstaff on West Cowes parade in line with the west end of the Chapel bearing S.W. ½ S., and Notice board on Shrape mud S.E. ¾ S.

Buoy No. 4—*can, red*—is moored in 7 feet, 310 feet W. by N. ¼ N. from buoy No. 3, with outer face of pontoon at Fountain pier bearing S. ¼ E. (nearly), and east extreme of Royal Yacht club house in line with east extreme of Trinity church W. by S.

Buoy No. 5—*can, red and white chequered*—is moored in 8 feet with north-east angle of Fountain pier in line with flagstaff bearing W. by S. ½ S., and north flagstaff on West Cowes parade N.N.W. ½ W.

Buoy No. 6—*can, red*—is moored in 6 feet, with east end of Medina Commercial pier in line with Thetis tower bearing S. ¼ E., and north flagstaff on West Cowes parade in line with north-east extreme of Marine parade N.W. by N.

Buoy No. 7—*can, red and white chequered*—is moored in 9 feet, with north end of East Cowes barracks in line with the south end of Slatwoods bearing S.E. by E. ½ E., and Thetis flagstaff in line with east extreme of Thetis dock S. by W.

Buoy No. 8—*can, red*—is moored in 6 feet, with Notice board on Shrape mud in line with tower on sea wall at East Cowes bearing East, and east end of Medina Commercial pier in line with Thetis tower S. ¼ E.

NOTE.—Middle buoy (black), between buoys Nos. 5, 7, is removed.

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